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Event and Comment.

The Lamb-Raising Industry.

WITH the prospect of developing a Queensland export trade in fat lambs to the extent of at least 500,000 carcasses per annum, the Minister for Agriculture and Stock (Mr. F. W. Bulcock) has arranged for the introduction of English types of rams, which will be used for experimental purposes on the Darling Downs and on farms below the Range.

Arrangements have been made with the Brisbane Abattoir to treat the lambs so produced and to report on their condition. Reports from Smithfield when the carcasses eventually reach that market will also be supplied.

Mr. Bulcock is keenly interested in the possibilities of the lamb-raising industry. In the course of a Press interview he said that a conservative estimate placed the export figure at not fewer than 500,000 lambs per annum. The chairman of the Queensland Meat Industry Board (Mr. E. F. Sunners) had given very close attention to the matter, and had made the estimate, which was fully supported by other inquiries.

Queensland in the past had paid too little attention to the raising of the type of fat lamb for which there was a ready market overseas, added Mr. Bulcock. Recently experiments had been decided upon by the State Government in an endeavour to determine the right cross-breed type in various districts of the State. Up to the present rams of the Southdown, Border Leicester, and Romney Marsh breeds had been purchased. Now it had been arranged to buy more rams of British breeds in the Riverina district of New South Wales.

Arrangements had also been made for the use of a property at Cambooya as a receiving depot, and all rams from the South would be received there. They would be sent by arrangement to the sheep farmers to whom rams were being allocated. The Romney Marsh would be the only breed allotted to farmers below the Range, and the Border Leicester, Southdown, and Dorset Horn, and, to a limited extent, the Shropshire also, would be placed on the Downs.

Two farmers in each district had been selected for the purpose of carrying out this experimental work, Mr. Bulcock added. It was desired that any farmer who received rams under the plan should take two or three breeds, so that comparative data might be obtained. The plan would be extended to other districts as opportunity offered.

Hitherto fat lambs have not figured very largely on outward manifests from Queensland ports, so Ministerial policy in this connection will be commended by all interested in the further development of our export trade. A recent investigation shows that Queensland ought to be able to export at least 500,000 carcasses of fat lambs annually. Of more than 3,000,000 carcasses sent from Australia for the year 1932, Queensland contributed only 23,000; and two years before that shipments were as low as 11,000. Our seasonal conditions favour the fattening of lambs and landing them on the British markets before the early spring arrivals from any other part of the Commonwealth; and market reports show that early lambs always command a high price. To get the best results it is essential that the right type of lamb should be produced, and the methods chosen by the Minister are commended in commercial circles, as well as by many people engaged actively in or associated directly with rural enterprise. His proposal to co-operate with selected farmers in different districts in experimental and demonstrational work will have the effect of stimulating both individual and general local interest, and of ensuring the success of the project.

The Rise in Wool.

ALTHOUGH the pastoral industry has had to face disastrous losses in both the paddock and the market during the last few years, the rise in wool prices, together with a bountiful season in most grazing districts, has altered the whole outlook, especially for those who are able to replace their sadly depleted flocks. It will be a long time yet, however, before the industry can recover from the effects of the economic blizzard, but the improvement in the wool market is a happy augury of better times. What the increased prices for wool means to Queensland is very impressively set out in a recent review of our pastoral year. Based on the estimated output for 1933-34, and an estimated average of £20 a bale, the increased prices mean more than £3,000,000 yearly if values hold.

It is difficult, however, to estimate the value to the State and the Commonwealth of the improved market, because the selling season is only half way through. But on present figures, allowing for a substantial shortage due to adverse seasonal conditions, the Queensland output of 476,000 bales of greasy wool (including all shipments) may be estimated at £20 a bale gross, representing a return of £9,520,000, as against 500,523 bales for 1932-33 for a return of £6,499,561. This would, therefore, mean an improvement of more than £3,000,000 for the year. On the same basis, the whole Australian clip, approximately 2,823,700

bales, will probably return £56,000,000, compared with £35,043,054 for last year. To quote from the review referred to:—

> It is particularly pleasing to be able to show, by means of the average prices for the last three years, and for the six sales that had occurred during the first half of the 1933-34 season, the excellent recovery that wool prices have made. This is an improvement to be welcomed more especially in view of the disastrous times the producers have been through. Many of them had experienced heavy losses and were not in a position to restock. With the present exceptional season through Australia the outlook for a good increase in the total number of sheep is good.
>
> In view of the better prices now ruling, it is of interest to look back over the last few years, to weigh the past with the present. The prospects have already been indicated. From the official records of the Registrar-Geenral (Mr. G. Porter), and from statistics compiled by Dalgety and Co., Ltd., information of interest to all sections of the community is available. For instance, in the peak period of 1925-26 the State wool clip from 20,663,323 sheep realised £13,146,356 (average price a lb—greasy 26½d., scoured 46d.).
>
> Wool prices have been at a very low level for some years. To emphasise this it is necessary only to quote the average prices a lb. of wool for the years under discussion. Last year the average was a shade over 9d. a lb. For 1931-32 it was 8·61d., and for 1930-31 it was 9·86d. These averages provide an astonishing contrast with the 1925-26 averages—greasy 26½d., scoured 46d.
>
> This year, beginning with the first sale in June, a steady increase in the average price, as well as in the highest prices, occurred. These averages improved from 11d a lb. for greasy and 18·89d. for scoured wool, to 16·9d. and 27·55d., respectively.
>
> The highest prices—which are never so good a guide as the averages—improved from 16¾d. and 26½d. to 25d. and 40¼d., respectively.
>
> A pleasing feature of these increases is that they represent no sudden jump, but a gradual improvement, which, it is hoped, may continue, or at least remain steady.

The Agricultural Outlook.

REVIEWING the agricultural situation generally at the end of the year, the Director of Agriculture (Mr. A. E. Gibson) said in the course of his remarks that the outlook for the agricultural industry in Queensland this year is particularly bright from a production point of view.

The maize-growing areas of the State had received a thorough soaking, the spring crop was fast approaching maturity, and conditions were all that could be desired for the standing corn.

Summer fodder crops were looking well, particularly the sorghum varieties and panicums. Farmers should seize the opportunity to conserve surplus growth which it was reasonable to suspect would not be required for purposes of autumn stock feeding, in view of the flush growth at present noticeable in the pastures.

The Minister's New Year Message.

To the

FARMERS OF QUEENSLAND

RECENTLY I heard a traveller of wide-world agricultural repute refer to our farming community as "Australia's sturdy yeomanry." It was, I think, an apt phrase, rich in historic associations, and expressive of our heritage of determination and resolute courage. These attributes have been in clear evidence during the year just ended. Hope and disappointment have alternately held sway over our farming population, but rarely has despair assailed us.

A courage carrying with it a vision of the future is slowly but surely being justified, and we may look forward to happier times during the coming year.

The most notable achievement of the year in rural economics was the stabilisation of dairy products, and this should prove the forerunner of a general Australia-wide stabilisation policy based on Australian standards.

The past year witnessed a steadily growing world-wide movement towards the maintenance of economic security for our farming peoples, and we may reasonably anticipate rapid and beneficial readjustments as soon as the necessity for them is clearly demonstrated.

On behalf of the staff of the Department of Agriculture and Stock and myself, I wish the producers of the State health, security, and contentment during the coming year.

Frank. W. Bulcock

Banana Thrips and the Problem of Its Control.

By J. HAROLD SMITH, M.Sc., N.D.A., Entomologist.

(Continued from page 524, Volume XL.)

Sulphur and Nicotine Dusts in the Control of the Banana Thrips.

THE possibilities of inert dusts for the control of the banana thrips have been thus carried to a stage at which there appeared to be no material advantage in pursuing the subject further. One other line of inquiry, however, seemed to warrant investigation, this being the utility of sulphur dusts.

In recent years entomologists have paid some considerable attention to the quality of the sulphur dusts used for insecticidal purposes, and have consequently dispelled some of the confusion previously associated with their action. These developments have led to an improvement in the commercially available supplies, although the products are hardly yet sufficiently standardised. For present purposes, the following points are significant:—

(*a*) That the principal toxic to both insects and fungi is gaseous sulphur. Other probable constituents in an atmosphere bearing particulate sulphur may be sulphur dioxide and hydrogen bisulphide, but these have been shown to be relatively non-toxic on ordinary concentrations such as are found in the field.

(*b*) That atmospheric conditions limit the toxicity of the dust. The chief among these would be temperature, which is said to determine the production rate of the volatile derivatives given off at the higher temperature range. In the view of some workers, humidity is also a conditioning factor, but Goodwin and Martin, working under controlled laboratory conditions, demonstrated that varying humidities make no appreciable difference in the rate of volatilisation at the same temperature. Other factors have been also suggested, but the contribution of these is negligible except in so far as they alter, directly or indirectly, the temperature at which volatilisation takes place. The temperature influence may help to explain the contradictory reports circulated by users of sulphur dusts, and to evaluate any worth which they may possess. Using deposition of stains on copper as the index to the rate of volatilisation of sulphur, Goodwin and Martin showed that at temperatures above 100 degrees Fahr. the increase in the rate of generation of sulphur fumes is very rapid. Confirmation is obtained in the field by the fact that it is invariably in regions of high temperatures that sulphur finds a niche in entomological practices. Thus, in California sulphur dusts are requisitioned in quantity for the control of the citrus thrips, a pest of some notoriety in that State. In view of this it would seem that, given good-quality sulphur dusts and similar temperatures, comparable results would be obtained in other parts of the world.

Great strides have been made in the manufacture of sulphur dusts during recent years, and significant developments are pending. This trend is outlined by De Ong and Huntoon. Working on the assumption that the inherent value of sulphurs depends on the state of subdivision, improvements in grinding methods have been introduced, and to-day very fine grades of ground and sublimed sulphurs are procurable in Australia. Precipitated sulphur, which has attracted some interest, is obtained by a variety of methods during the extraction of illuminating and oil refinery gases. The method of precipitation controls the particle size. Fineness is probably their greatest asset, and some experimental work has been carried out which indicated that this form of sulphur was worth investigating for the control of the banana thrips. Laboratory and field experiments were accordingly initiated.

Laboratory tests preceded and determined the scope of the subsequent field work. Initial stocks of precipitated sulphur were purchased locally, the sample procured showing greyish-green characteristics. The laboratory trials were arranged in the same manner as adopted in the trials of inert dusts, with the slight but significant difference that at least one-third of the individuals in each colony were adults. The establishment of the colonies on dusted fruits was anything but an easy matter, for both immature forms and adults tended to leave the fruits on which they were placed and wander over the walls of the glass container. The younger forms were particularly sensitive and their survival value was consequently low, but some larvæ and a few adults kept the colony intact for a few days. Ultimately, within a week, the colony if not exterminated was reduced to dimensions insufficient to cause rusting on the surface of the fruits. On the check fruits the initial colony throve for some time, and at the end of a fortnight or so its numbers were increased through the addition of first-stage larvæ hatched from eggs laid in the fruit subsequent to the establishment of the colonies. No parallel phenomenon occurred in the sulphured fruits, though eggs had been laid in the rind. It can hardly be supposed that the sulphur would have an ovicidal value; hence it is more probable that the physiological role of the sulphur is to inhibit the effective emergence of the larvæ at the time of eclosion from the egg. Such observations as those provided by closed containers can hardly be translated into the field—there are decided differences in the two habitats; but they indicate that under certain positive conditions some forms of sulphur may play a useful role in the control of the banana thrips.

Preliminary trials in the field during the same summer confirmed the observations in the laboratory. Here the sulphur dispersed individuals in the colonies from the base of the hands, the insects shifting to the tips of the fruits. After dispersion, colonies were not re-established, and it seemed certain that the numbers, particularly of the first-stage larvæ, had been considerably reduced, either by death *in situ* or by dropping off the fruit. The dust used in the field on this occasion was identical with that handled previously in the laboratory, and the results were for the most part comparable.

From these preliminary results, wider work in the field seemed desirable on a scale sufficiently large to estimate the value of precipitated sulphur and some other selected dusts, not on the thrips infestation, but rather on the rust incidence which forms the economic significance of the pest. One consideration which hampers the critical evaluation of

any insecticide applied to the banana bunch is the impracticability of accurately measuring the rust incidence. There may be variations from bunch to bunch and from hand to hand within the one bunch; there may be discolouration without splitting should thrips attack be delayed, or splitting without marked discolouration should early infestation be heavy and growth rapid. Still, as the thrips population, for reasons already set out, is not an index of the economic significance of the pest on any particular plantation, an attempt must be made to measure rust in some intelligible terms. Without this any opinion on the worth of control measures depends entirely on the observer's ability to translate his own visual appreciation of any given rust appearance to other people.

For the purposes of the field work about to be described, an effort has been made to classify bunches when harvested on a basis of rust incidence, each individual bunch when cut being placed in one of the following categories:—

A.—Bunches in which the discolouration, if any, is restricted to the base of the fruit; blemishes insufficient to affect the value; assigned numeral—1.

B.—Bunches with rust along the sides of the fruit both at, and away from, the base of the fruit, though with no signs of obvious cracking; mild infestation of the bunch with extended discolouration due to the phenomenon of fitting between adjacent fingers; assigned numeral—2.

C.—Bunches in which the cracking is superimposed on rust with a fairly extensive range; early thrips infestation followed by growth cracks on the feeding surfaces; assigned numeral —3.

D.—Bunches in which splitting has appeared on the surfaces of at least some of the fruits, while others are badly cracked; assigned numeral—4.

In connection with the marketing of these four grades of bunches, no waste would be found in the first group and very little in the second. C and D are definitely poor grades, the fruit in which would hardly warrant despatch to the southern markets unless ruling prices were exceptionally high. Good-quality fruit may sometimes be culled from some of the hands in grade C, though little could be salvaged from the poorer grade D.

These four categories are entirely arbitrary and inevitably express a mean for the bunch concerned in which, of course, the rust incidence of the fruit in each hand will vary. In classifying the bunches on the above basis it was found that the condition of the upper four hands determined the quality assigned to individual bunches, for unless abnormal conditions supervened—*e.g.*, fruit fly infestation and the use of stockinette for protection—the terminal hands included some saleable fruit. Most of the larger and better filled fruits in the basal hands suffer more severely from rust than the slower maturing fingers in the terminal hands, and the total loss on this account may be considerable. Some growers tend to wait till the lower hands are thoroughly filled before cutting the bunch, and in doing so often sacrifice the good fruit in the upper hands for that of inferior quality in the lower. In the present work the fruit was cut as early as was compatible with reasonable maturity.

As stockinette sleeves tend to aggravate the rust incidence in the bunch from a given thrips population, no special precautions were taken against the fruit fly, hence losses from this cause were anything but negligible, and as might be expected the occurrence of split fruits through the plantation increased the losses due to this pest.

The plantation was regularly laid out, and two acres with a south-easterly aspect bearing stools just about to bunch were selected for the work. The plants had been well tended, weed growth being kept down to a minimum and the old leaves stripped regularly. The soil type was akin to that associated with the more destructive outbreaks of thrips rust in the north, being reddish in colour, volcanic in origin, and typical of many of the foothills along the North Queensland coast. No fruit had been cut prior to the first dusting, and 454 bunches were traced through their whole development from the time of inversion to cutting. The systematic examination of these at weekly intervals allowed regular observations on thrips activity during the summer months, the development of rust in relation to thrips population, and the influence of bunch conformation on rust incidence.

Two areas were selected, each comprising approximately one acre, and rows in these were mapped out on a system suitable for field experimental work, so that each row subjected to a single treatment represented a single plot. Thus in the first area there were 16 plots with quadruplicate treatments of three dusts and equivalent checks, while the second held 12 plots with triplicate treatments and the necessary checks. In the former, treatments were made weekly and in the latter fortnightly. Each plot in the first area carried some 12 to 19 recordable bunches in the row, while the larger plots of the second area ranged from 27 to 43 with the majority round the 30 mark. The discrepancy in the number of bunches matters little, for any conclusions which may emerge from the work will be drawn from both qualitative and quantitative data. The arrangement of the work on quantitative lines tests the method in this class of work, while the incidental semi-random distribution of the plots reduces, or ought to reduce, differences in rust incidence due to variable bunch conformation ascribable to scrub shade, subsurface drainage, &c.

Three dusts were submitted to comparative tests:—

(*a*) *Nicodust*—a proprietary brand containing 2 per cent. of nicotine as nicotine sulphate with hydrated lime as filler.

(*b*) Precipitated sulphur showing the following analysis:—

	Per cent.
Sulphur	97·2
Ash	2·1
Chancel degree of fineness	82

The sample used in the preliminary trials had the constitution—

	Per cent.
Sulphur	99·6
Ash	·2
Chancel degree of fineness	85

but apart from its greater purity and better particulate form, there was quite a difference in the colour of the two types. The preliminary sample was greyish-green, very different from the bright yellow mass appearance characteristic of the bulk supplies used in the large scale field experiments now under discussion.

(*c*) Nicodust and precipitated sulphur in the proportions 2 : 1, being mixed immediately before using.

All three dusts were applied to the plants by means of a rotary dust gun fitted with a flexible arm, the construction of which is detailed in Appendix IV. The fishtail feed gave an even charge, while the manipulation of the apparatus involved no difficulty.

In evaluating the effects of any particular treatment, the rust incidence values for each plot were determined as shown in Appendix III., using as a basis for calculation the numerals assigned to each bunch at the time of cutting. The four categories A, B, C, and D carry the values 1, 2, 3, and 4 respectively, hence in the estimate for the value of any particular dust, an assigned value of, say, 1·5 would indicate that the value of the bunches lay midway between categories A and B.

The summary values given to each treatment in the two areas at the conclusion of the work were as follows:—

—	Area I. (Treatments Weekly.)	Area II. (Treatments Fortnightly.)
Nicodust	1·7	2·3
Nicodust and precipitated sulphur	1·8	2·2
Precipitated sulphur	2·1	2·4
Check rows	2·5	2·1

The nature of the data is such that any statement of the calculated standard error would mean very little, but the summary statement is suggestive. In the weekly treated area, the maximum rust incidence per plot occurs when bunches are untreated, and the minimum is found when nicodust is used. On the other hand, fortnightly treatments with any of the three dusts effected no noticeable improvement. In discussing the pros and cons of quantitative data, a number of considerations have to be kept in mind which concern the different conditions in different parts of the plantation during the season. Of the two areas, that dusted fortnightly occupied the upper end of the slope, while the other abutted against a gully at its lower end. For sundry reasons, probably associated with drainage, the stools growing in the vicinity of the gully possessed a more vigorous growth than the remainder of the plantation, and bunching difficulties which were general through the plantation in January were less accentuated there. The season was somewhat exceptional. Normally, summer rains commence in late December or early January, but in the summer of 1930-31, exceptionally dry, hot weather continued until the end of January. Bunches thrown during this dry spell in the first three weeks of the month were invariably badly rusted, not on

account of a larger thrips population than that of the early and late thrown bunches, but following compaction of the hands and delayed inversion. Those in the upper part of the slope showed the abnormalities to a very marked extent. Such bunches are always difficult to dust properly, and they introduce added variations from bunch to bunch in the efficiency of their individual treatments. Another disturbing factor was introduced into the plantation in February, when a virulent form of leaf spot swept through part of the area, commencing in the gully region adjoining the scrub and working outwards.

The interaction of all these factors on the data does not, however, obscure some of the more obvious conclusions emerging from the work. The chief among these are—

(*a*) If bunches are thrown normally, weekly dustings with nicodust do minimise losses due to the banana thrips, even when the pest is more than normally destructive. Conversely, if bunches are thrown abnormally, dusting, no matter how efficiently carried out, is incapable of adequately coping with the trouble.

(*b*) Precipitated sulphur used either weekly or fortnightly gives no appreciable control over the banana thrips under conditions of heavy infestation, while no advantage is secured by combining the nicodust with the brand of precipitated sulphur used.

(*c*) The general health of the plantation is a necessary basis for thrips control, without which any supplementary measures can only be of limited value.

The disparity between the results with precipitated sulphur in the field and in the laboratory is somewhat striking. Normally it is accepted that the toxic properties of the dust depend entirely on the generation of gaseous sulphur, the rate of generation being controlled by ruling temperatures. The dust is consequently most used in countries characterised by high day temperatures during the pest-active season. In coastal Queensland, the shade temperatures during the summer months vary between maxima of 80 and 100 degrees, sometimes going above the latter, though not for any considerable length of time. The lower temperatures are common during the wet periods, and the higher when dry conditions suitable for dusting occur. These shade temperatures, however, give little indication of the real conditions in the bunch habitat, for it is quite exceptional to find the whole of the bunch under shade conditions. Hence in any one bunch, part may be in complete shade while the remainder is exposed, and the mean effective temperature over the whole bunch would be much higher than either of these figures, at least during the spells of fine weather. The rate of generation of gaseous sulphur increases rapidly when the temperature rises to 100 degrees Fahr., and bunches grown in the North ought to respond to treatment, for the temperatures are within the limits required for the rapid generation of the fumes. Apparently the presumption does not hold for the quality of the dust used.

Any discrepancy between the results in the field and those in the laboratory with any one sample of precipitated sulphur may be ascribed to dissimilarities in the two environments. In a glass cylinder kept indoors there would be no air currents to waft away fumes which

would otherwise accumulate to a concentration toxic to the insects. But the more important discrepancy, however, is not that between the field and laboratory data—it is rather the vastly different results from field trials with two different samples of precipitated sulphur, only one of which had been used in the laboratory. A difference of this kind must depend on the quality of the dusts used. There are therefore two factors which together or independently may shed light on the observed data, the first concerning the absence of air currents in the laboratory, the other the quality of the dusts used. The former requires no special elaboration.

The samples of precipitated sulphur used in the earlier phases of the work were greyish in colour, in contrast to the bright yellow of the bulk supplies purchased at a later date. Variations in the colour of different brands of sulphur are usually put down to the nature of the impurities in the sample, but their association with the insecticidal value of the dusts is indicated by the following quotation from a paper by De Ong and Huntoon:—

> "The grey colour of the sulphur recovered in the gas-purification process favours sublimation at low field temperatures. This principle has long been recognised in France, where dark-coloured sulphurs are chosen for early spring work on the control of mildew."

Attempts to elucidate the chemical basis behind the practice have so far met with no success, but the point may prove to be of interest not only in connection with the explanation of the current experimental work but also in connection with the standardisation of dust for insecticidal and fungicidal requirements. At present the relative merits of the various sulphurs are supposed to depend entirely on the particulate size of the samples, following the assumption that gaseous generation is proportionate to the surface area exposed. Perhaps other factors are of equal importance. Two problems would thus seem to emerge from the work on sulphurs—

> (*a*) What are the distinctive principles of the grey-coloured sulphurs which encourage the sublimation at comparatively low temperatures? Such sublimation may be due to some special impurity from a particular method of manufacture, but, in any case, it is a chemist's rather than an entomologist's problem.
>
> (*b*) Is the particulate size of any sample of sulphur an accurate index of its toxicity over the whole temperature range?

It has been impossible to get supplies of precipitated sulphur comparable to those used in the first instance, and for that reason work in the field has been suspended; but even were they available, the two questions should be answered before it can be profitably resumed.

The losses in the plantation as a whole through rust were consistently high, except in those plants treated weekly with the nicodust. If the bunches when first completely exposed were clean, they could be kept clean. The values assigned to the bunches indicate the real value of repeated dustings, though they probably under-estimate it, for the arbitrary numerals assigned to bunches of different quality tend to lessen the statistical influence of the best and exaggerate that of the worst fruit.

The main objection of the grower hinges on the cost of the operation. There is some ground for this criticism, though actually the economic justification of dusting depends on the anticipated value of the fruit when marketed. It is rather unfortunate, therefore, that fruit grown during the summer when some control measures are imperative should be sold at prices depressed by the seasonal influx of other fruits to the principal markets. The advisability of dusting is, however, a matter for the grower to decide after weighing all probable eventualities. In most plantations the expense of the insecticide would not be the determining factor. It is rather the cost of the necessary labour, which can be very considerable when repeated dustings are required. This item in the cost has, in the past, been particularly high because the available dusting apparatus, designed for other purposes, is in many respects quite unsuited for the bunch treatment of the banana plant. Bulb blowers or small dust guns have both been used, but the hopper capacity of each is limited, while the thorough dusting of any series of bunches requires some agility on the part of the operator. The device used in these experiments is a considerable advance on either of these, though, even so, it is crude and capable of improvement. It consisted of an ordinary rotary duster in which the feed arm was converted from the rigid to the flexible form. This permitted a dust discharge in any desired direction, while the ordinary mechanics of the duster ensure a more even dust cover than any other method. The time necessary to treat individual bunches is correspondingly reduced and the incidental labour charges with it. Even so, the cost of dusting remains admittedly high, but an observant grower can still further reduce it by adjusting his dusting to the precise needs of his plantation. No good purpose is served by dusting bunches before the bracts loosen, and little before they are shed from the bunch. No remedy can be prescribed for injury prior to this stage, but adequate dusting at the bract-shedding stage will inhibit further thrips development and minimise the injury accordingly. Systematic dusting may then keep the thrips population within reasonable bounds.

In this series of field experiments, only a nicotine dust in which nicotine sulphate furnished the toxic ingredient was used. Nicotine sulphate is very convenient from the manufacturer's point of view, for it is a standardised product which lends itself to the preparation of dusts with a given nicotine concentration. From the entomological point of view it has, however, certain drawbacks. When exposed, free nicotine is given off, the rate of evolution varying with the temperature at the time of application. The rapid evolution of nicotine fumes is very desirable in the control of the banana thrips. Dusts in which free nicotine is substituted for the nicotine sulphate liberate toxic fumes more rapidly than those containing nicotine sulphate, and thus better meet the special requirements of this problem. A comparison of both types of dust in the field has shown that these free nicotine dusts have a greater value for the control of the banana thrips than the nicotine sulphate dusts in common use throughout the State. It is therefore suggested that if the incorporation of free nicotine in dusts can be effected without interfering with the desired standardisation of the insecticide, manufacturers would be well advised to make the substitution.

In the summer of 1929-30 experiments with a mixture of a free nicotine dust and precipitated sulphur showed rather promising results in the field. These prompted the inclusion of similar trials in the

summer of 1930-31, but the results as just recorded are disappointing. Subsequent inquiry into the quality of the dusts showed a difference in the alkalinity of the two samples of sulphur, one being neutral and the other alkaline in their respective reactions. The alkalinity of the second sample of sulphur would depress the toxicity of the nicotine dust, and the disparity of the two results may be attributed to this cause, together with differences in the quality of the sulphur used. There is, however, no reason to suppose that such a compound dust with ingredients possessing the desired specifications should not be an improvement on the nicotine dust when used alone for the control of the banana thrips if the prices are comparable. The independent effect of the sulphur should be apparent after the toxic properties of the nicotine have been exhausted. Further work on this subject is much to be desired.

GENERAL DISCUSSION.

From the data presented it may be practicable to summarise the work, discuss its implications on the larger question of control, and restate the problem for the future. It has been pointed out that the general health of the plantation furnishes a fairly good indication of the possible worth of even the best control measures formulated. If this is at a low level, abnormalities in bunching and rates of bunch development both increase the period of pest effectivity and limit the utility of any dusts which may be used. It may be a mere coincidence that the extension of rust incidence through the State in recent years has coincided with the general deterioration of many plantations. But in view of the early discussion of the factors which tend to increase the losses in the fruit due to the banana thrips, there would appear to be strong grounds for supposing that there may be some relation between the two events. Some years ago the life of a plantation covered a profitable period of from four years upwards, but to-day very few plantations last for even four years. Various explanations have been suggested—the cumulative effects of pest and disease organisms, the transition of plantations from good to poorer types of soil, the widespread incidence of root failure and, perhaps, stock deterioration. There may be a certain amount of truth in all these, but from the present viewpoint their cumulative effect is to introduce growth conditions more favourable to thrips activity than would otherwise be the case. The tacit association in the south of thrips activity with dry weather conditions may again be a reflex of the same thing. One is too apt to assume that acute rusting in any district is associated with an epidemic of the pest. It may be partly so, but the precise conditions which are said to favour such hypothetical epidemics are precisely those which induce morphological aberrations in the plant, themselves sufficient to accentuate the injury caused by any given thrips population. The southern experience in 1931 is a case in point—a severe dry spell synchronising with unprecedented rust over a great part of the commercially producing areas, and at the same time producing all the abnormalities previously described in some detail.

The work has so far been confined to dusts which are cheap enough to be adopted in plantation work if they are sufficiently effective to make any appreciable contribution to the control problem. The supposed efficacy of some stomach poisons is found to be an attribute, not of the toxic constituent but of the physical properties belonging to the dust or spray deposit, these probably inhibiting the free movement of the insect.

The studies on this phase of the subject do not indicate any great possibilities for inert dusts as at present available. An improvement could no doubt be effected if the dusts were applied in fluid media to which spreading materials had been added, but the practical obstacles seem insuperable. Until some means are devised for increasing the adhesion of such dusts to the surface of the fruit, no further progress seems possible. The problem has been recently broached in America in another connection, and oil fluids are incorporated into the dust for this purpose just before application. The manufacturing difficulties are, however, of some moment, for though, perhaps, simple when the requisite mixing plant is available, they can hardly be duplicated in Queensland banana plantations. It will be interesting to follow developments in this field of research, for they cannot but impinge on the local problem, even though inert dusts are themselves relegated into the background. If such improvements could be introduced for, say, nicotine dusts, they would serve a dual purpose—first in the destruction of the thrips, and second in restricting the pasturage of any colonies which may subsequently be established. At present, however, no good purpose is to be served by farmers applying inert dusts in preference to others which are known to have definite toxic properties.

Of these, dusts with a nicotine content are most important. Even under conditions of heavy infestation far in excess of that common in the South, tangible control can be secured by weekly applications of the dust. Wider-spaced applications proved of little value when the infestation was heavy. It is probable, however, that under southern conditions, where the numerical incidence of the pest is normally less than in the North, fortnightly dustings may be useful, but without any experimental experience on the subject no definite opinion can be expressed. The labour costs incidental to dusting can be materially reduced and the efficiency of the treatment increased if the rotary duster modifications detailed in Appendix IV. are adopted. Without some such improvements, the labour costs can easily be excessive. Doubtless the device can be improved by engineers whose province it is to devise apparatus of this kind.

At the present time the bulk of the nicotine-containing dusts used in the State consist of hydrated lime in which is incorporated the required amount of nicotine sulphate. The adoption of the latter as a source of nicotine may be due to the standardisation of the supplies and the consequent simplicity of the manufacturing process. Actually, however, the toxicity of the dust is dependent on the rate at which the nicotine sulphate dissociates and liberates nicotine, the generation of which is accelerated at high temperatures. Better results are procured when free nicotine rather than nicotine sulphate has been used in the preparation of the dust, for the evolution of the fumes is more rapid and the toxicity consequently increased. It is suggested, therefore, that if the preparation of nicotine dusts with free nicotine is practicable, manufacturers would be well advised to make the substitution.

The utility or otherwise of sulphur is still an unsettled question, the present studies having led up to what are essentially chemical questions. Precipitated sulphur of an exceptionally high quality and a dull grey colour yielded very promising results in both the laboratory and the field. Subsequent work with a lower-grade precipitated sulphur gave results in no way analogous to these. There are two possible

explanations of the varying results attributable to the two forms. The analyses suggest greater purity and finer particulate dimensions in the better sample, and perhaps this in itself, by increasing the gaseous generation at any given temperature, would be a sufficient cause for the observed results. Peculiarly enough, it has been impossible to procure further supplies of the better type of precipitated sulphur. Those obtainable of equivalent fineness are quite distinct in colour, being bright yellow rather than grey. In the literature dealing with sulphurs there are occasional references to some of a greyish colour which are credited with high insecticidal properties. There has apparently been no attempt to explain the colour or to prove any association with the insecticidal properties of the sulphur, though it is assumed to bear some such relation. There is thus evidence that this colour has significance for the entomologist. Until this evidence is sifted, it must be assumed that particulate size alone determines the insecticidal properties of any given sulphur dust. This assumption has been responsible for considerable improvements in the manufacture of sulphur dusts, and specially treated sulphurs, ground, precipitated, and colloidal, are on the world market. Some of these may be useful for certain pests, but the prices quoted in Australia are often quite prohibitive so far as the control of the banana thrips is concerned.

Recommendations.

(*a*) Nicotine dust in which the toxic ingredient is free nicotine and the carrier hydrated lime has proved the most efficient of the dusts handled, and it is suggested that during the summer months growers should make the necessary provision for the treatment of their fruit. Dusting should commence immediately the bracts are shed; bunches may be dusted earlier, but there is no experimental evidence to indicate that any advantage is gained by doing so. If the cost of the operation is to be kept down to a minimum, the apparatus should be based on the principles outlined, the feed arm of the rotary duster being converted to the flexible type. With all nicotine dusts, the best results follow their application when temperatures are high, hence midday treatments should yield the best results.

(*b*) Cultural practices such as manuring, suckering, &c., should all be designed to induce favourable growth conditions when the bunches are being thrown. Where a grower may reasonably expect his plantation to last over a period of years, he would be well advised to make his winter and spring crops his main source of income if the suckering programme can be so arranged. His bunches would then be thrown in autumn and early winter when the pest is least active. Any decrease in the size of his fruit would be amply compensated by the better market prices ruling when such bunches are cut. The severity of thrips rust incidence depends very largely on the grower's ability to maintain vigorous growing conditions in his plantation by good cultivation and the control of subsidiary pests and fungi.

(*c*) It is very desirable that the chemist, working under controlled laboratory conditions, should investigate the conclusions which seem to emerge from the current work with sulphur dusts.

Summary.

(*a*) The banana thrips previously regarded as an exclusively northern pest has during recent years penetrated the major producing areas in the south. At present it seems to be distributed through the whole of the State, though not always associated with rust on an injurious scale.

(*b*) The disparity between the incidence of the pest and the loss induced by it is traced to abnormalities in the bunch. In the absence of the insect, these would be of no great significance; coexistent with it they aggravate the injury. The main types of abnormality are discussed and their relation to the pest described. It is suggested that the recent increase in the losses due to the pest is associated with a deterioration in many plantations.

(*c*) Some studies have been carried out in connection with the control of the pest by dusting. Inert dusts such as kaolin and talc are found under laboratory conditions to limit the pasturage of the pest on the surface of the fruit at given concentrations. Instances of partital control by lead arsenate may be attributed to the physical properties of the spray or dust cover rather than to the toxic properties for which they are generally used. The utility of inert dusts for the field is limited by their general lack of adhesion and the frequent precipitation during the summer months.

(*d*) Favourable results in the control of the banana thrips by precipitated sulphur have followed the use of certain brands characterised by a greyish colour and extraordinarily fine particulate size. Some others more commonly available yielded less favourable results, hence there would appear to be scope for further work on this subject. Even if standardised brands of the better class precipitated or colloidal sulphurs were available, the current prices at which they are quoted would make their use uneconomic.

(*e*) Weekly dustings with nicotine dusts have given a reasonable measure of control in cases of unusually heavy infestation. The nicotine-containing dust should, however, be compounded of free nicotine rather than nicotine sulphate. The economics of the measure largely turn on the labour cost of application and improvements in the usual dusting devices for the specific purpose of treating banana bunches are suggested.

Acknowledgments.

The many-sided aspects of a problem such as this have prompted discussions with specialists in other spheres on several occasions. The writer is indebted to the entomological and other staffs at headquarters for their constant collaboration, to field officers of the Fruit Branch for assistance in connection with the plantation work, and, not least, to the growers who have made their fruit available for treatment. To all thanks are tendered, in particular to the Chief Entomologist, Mr. Robert Veitch, whose appreciation of the difficulties inherent in the problem has been a constant simulus.

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APPENDIX I.

THE ARTIFICIAL INDUCEMENT OF THRIPS RUST.

The experimental material consisted of two bunches, labelled for the purposes of reference A1 and A2, the former having just shed the bracts, while the latter was submature.

Bunch A1: Basal hand—Direct pricking with dissecting needles.

Fruits—

(*a*) Pricking comparatively heavy with considerable sap exudation. Pustules formed at each point of injury, with the outer edge dull green, the median portion ochraceous, and the hilum reddish-black; pustules in proximity to each other may coalesce; exuded sap persisted as drops of a gummy consistency.

(*b*) Pricking moderately heavy with little exudation. Features as in fruits (*a*), but pustules smaller in size and congealed drops fewer.

(*c*) Pricking mild with no obvious exudation. Features as in fruits (*a*) but congealed sap absent.

Bunch A2: Basal hand—Direct pricking with dissecting needles.

Fruits—

(*a*), (*b*), and (*c*), as in bunch A1.

Pustules as in A1, but larger in the younger bunch; the reddish-black hilum was absent, the entire centre cap being ochraceous.

Remarks—

(*a*) The whole of one side of the fruits was treated.

(*b*) The differences between the two bunches are explicable on the assumption that injured tissues of the older fruits have not the recuperative powers of the younger, and do not exude sap so freely.

Bunch A1: Hand 2—Scraping with dissecting needles to a moderate depth.

Fruits—

(*a*) Dashes irregular in direction but regular in series.

Marks persisted as lip-shaped structures with the outer edge dull green, the fringe of the lip dark brown, and the cavity ochraceous.

(*b*) Dashes regular in direction and series along the length of the fruit.

As in fruits (*a*).

(*c*) Dashes irregular in both direction and series.

As in fruits (*a*).

Bunch A2: Hand 2—Scraping with dissecting needles.

Fruits—

(*a*), (*b*), and (*c*), as in bunch A1.

Essentially the same structures induced as in the younger bunch, but the colour graduations were less obvious, the ochraceous colour being dominant.

Remarks—

(*a*) The structure of the rind permits splitting in any direction corresponding to that of the injury.

(*b*) The mature fruits reacted less severely to equivalent injury than the corresponding younger fruits.

Bunch A1: Hand 3—Scraping with a V-pointed eye scalpel.

Fruits—

(*a*) Dashes irregular in direction but regular in series.

(*b*) Dashes regular in both direction and series.

(*c*) Dashes irregular in both direction and series.

In all these the subsequent appearance corresponded with that of hand 2, in which the dissecting needle was used for similar treatments.

Bunch A2: Hand 3—Scraping with a V-pointed eye scalpel.

Fruits—

(*a*), (*b*), and (*c*) treated as in bunch A1.

Subsequent appearance was that of the corresponding hand in bunch A1, except that the callus was almost entirely ochraceous.

Bunch A1: Hand 4—Rasping with a file at various pressures.

Fruits—

(*a*) Rasping heavy.

Surface colour varied somewhat from black to ochraceous.

(*b*) Rasped lightly, the injured surface being then treated with the point of a dissecting needle.

Much the same as fruits (*a*)

(*c*) Rasped lightly, then the surface treated with fruit sap.

As in fruits (*a*) and (*b*), but the sap left a glossy deposit on the surface if applied in sufficient quantities.

Bunch A2: Hand 4—Rasping with a file at various pressures.

Fruits—

(*a*), (*b*), and (*c*), as in bunch A1.

Remarks—

(*a*) The fruit sap was obtained from the junction of fruits to the bunch stalk.

(*b*) The differences in the colour of the calluses seemed to depend on the depth of rasping.

Bunch A1: Hand 5—Sap applications to the fruits.

Fruits—

(*a*) Direct application of sap from pseudostem.

No trace of any marks of any kind.

(*b*) Direct application of sap from the bunch stalk.

Larger globules grey in colour with dark edges; smaller brown with a semblance of rust colour at the edges.

Bunch A2: Hand 5—Sap applications to the fruits.

Fruits—

(*a*), (*b*), and (*c*), as in bunch A1.

Results essentially the same as in the other bunch.

Remarks—

In abstracting the sap from the bunch stalk, the flow from the younger bunch was much more copious than that from those of greater age.

Bunch A1: Hand 6—Injury to the fruit surfaces plus thrips body contents.

Fruits—

(*a*) Dissecting needle scratches over a restricted area, to which crushed body contents and fruit sap were applied.

Results comparable with those of hand 2.

(*b*) Erosion with sandpaper plus crushed thrips body contents and fruit sap.

Results comparable with those in hand 4.

APPENDIX II.

INERT DUSTS.

Two inert dusts were available, kaolin and talc, duplicate trials being made.

Half the fruit was dusted and then inserted in a glass cylinder with shade adjustments, so that the clean portion was in the better lighted end. During the dusting the part to be kept free from a deposit was protected by means of paper wrappers. A thrips colony was established on the undusted section of the fruit, each colony comprising some fifty individuals.

Bristol board was attached to stiff cardboard by means of drawing pins, and the surface stained black with Indian ink. By pricking with a needle the white surface underneath could be exposed. Separate square centimetre areas on the one piece of Bristol board were thus arranged in a series which contained the following number of regularly placed white intrusions on a dark background:—

50, 100, 125, 150, 175, 200, 225, 250, 275, 300, 350, 400.

In estimating the dust concentration on any given fruit surface, the binocular appearance of such a surface was compared with the graded Bristol board series for purposes of visual comparison. From the known concentration of white spots in the square centimetre of Bristol board, the dust concentration on the fruit itself could be inferred, the magnification of the binocular being known.

The kaolin series was first arranged on 24th December, 1929, and contained fruits in each of the following series:—The numbers refer to the fleck concentration on the equivalent square centimetre of Bristol board showing the same mass appearance as the dusted surface under binocular observation:—

Series of Fruits.	Concentration at Initiation.
1	White
2	300
3	250
4	150
5	100
6	75

In series 1, 2 and 3, no thrips ventured over the dusted surface, and rusting was limited to the undusted parts of the fruits. In series 4, the line of demarcation between dusted and undusted parts of the fruit was less definite on the under surface where the colonies tended to congregate. Fruits in the remaining series showed rusting on both the dusted and undusted parts of the fruit, for the introduced insects split up into two sections one of which remained on the clean area while the other crossed the dusted surface to form a colony at the other end. Any limitation of rust incidence was due to a direct influence on the movements of the insect.

The critical point, *i.e.*, the minimum concentration which effectively hindered the movements of the insects, was between 6,000 and 8,000 particles per square centimetre of fruit surface, but even at lower concentrations there was still a hampering effect on thrips movements.

In the series of fruits subjected to similar handling with talc, the dust concentration on the fruits in the several groups was as follows:—

Series of Fruits.	Concentration at Initiation.
1	350-400
2	200-250
3	150-175
4	125-150
5	100-125
6	50-75
7	Below 50

Only fruits in series 1 showed an entire absence of rusting on the dusted surface. Series 2 and 3 were transitional, the thrips tending to break across the margin between dusted and undusted parts of the surface. Attenuation of the dust cover below this point allows more or less free movement of the insect until in series 6 and 7 the dust covers had little or no influence on the activities of the insect. As some slight breakdown took place in series 2, the higher concentration 250 is accepted as the limit to the thrips activity on dusted surfaces. In terms of particle concentration this would be 10,000 particles per square centimetre of surface.

EXPLANATION OF PLATES 1 AND 2.

Diagrammatic drawings from sketches made in the course of one laboratory experiment. In each case the end marked "A" of the fruit was in darkness and the end marked "B" was exposed to light. End "A" of all treated fruit was dusted with kaolin to the median line, end "B" being undusted. The left-hand illustration of each pair shows the upper surface as the fruit lay in the tube, the right shows the under surface.

The shading indicates the outlines of thrips pasturage and is heavier where the rusting was more severe.

PLATE 1.

I. Untreated fruit.

II. Dusted, series 1; concentration white.

III. Dusted, series 2; concentration 300 per magnified sq. cm.

IV. Dusted, series 3; concentration 250 per magnified sq. cm.

PLATE 2.

1. Dusted, series 4; concentration 150 per magnified sq. cm.

II. Dusted, series 5; concentration 100 per magnified sq. cm.

III. Dusted, series 6; concentration 75 per magnified sq. cm.

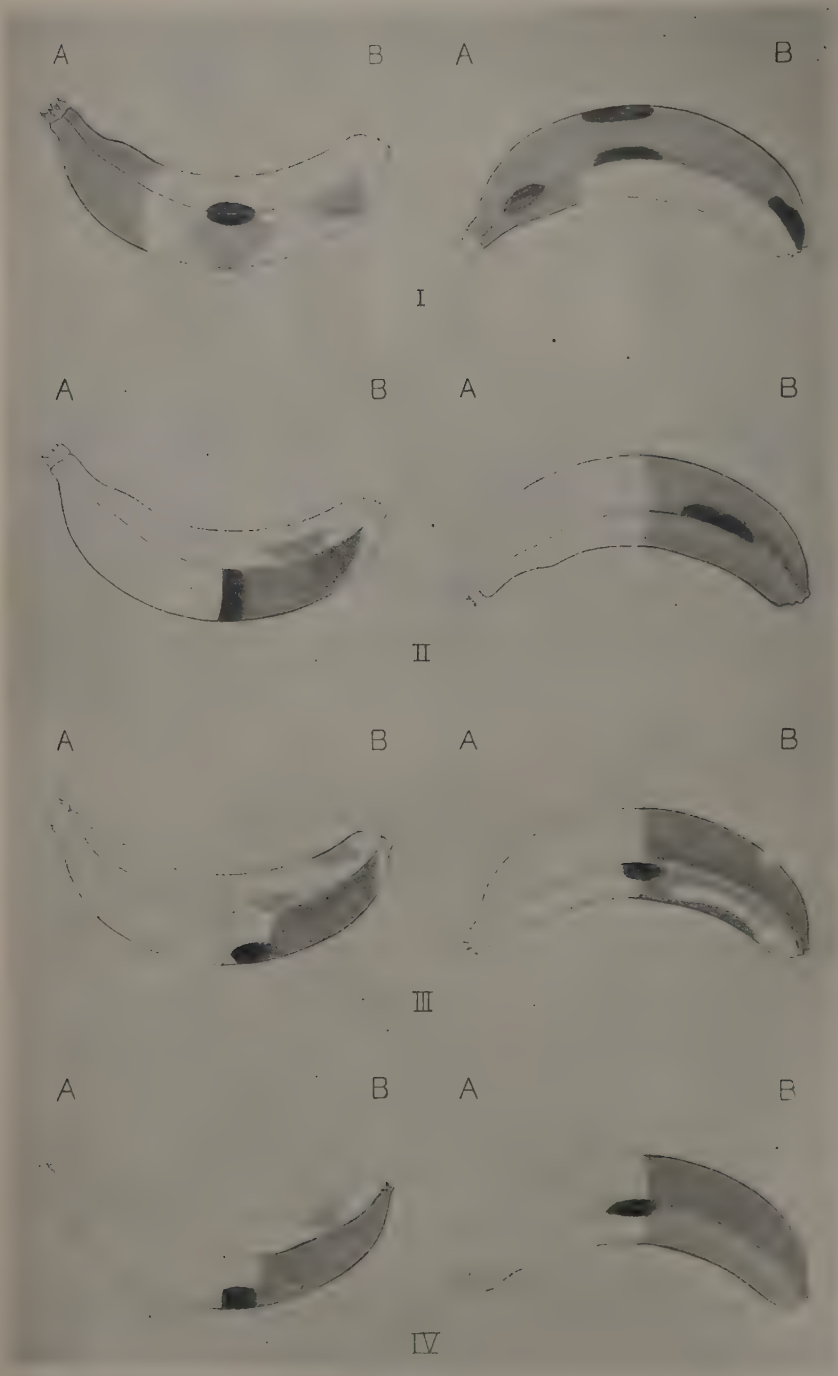

PLATE 1.

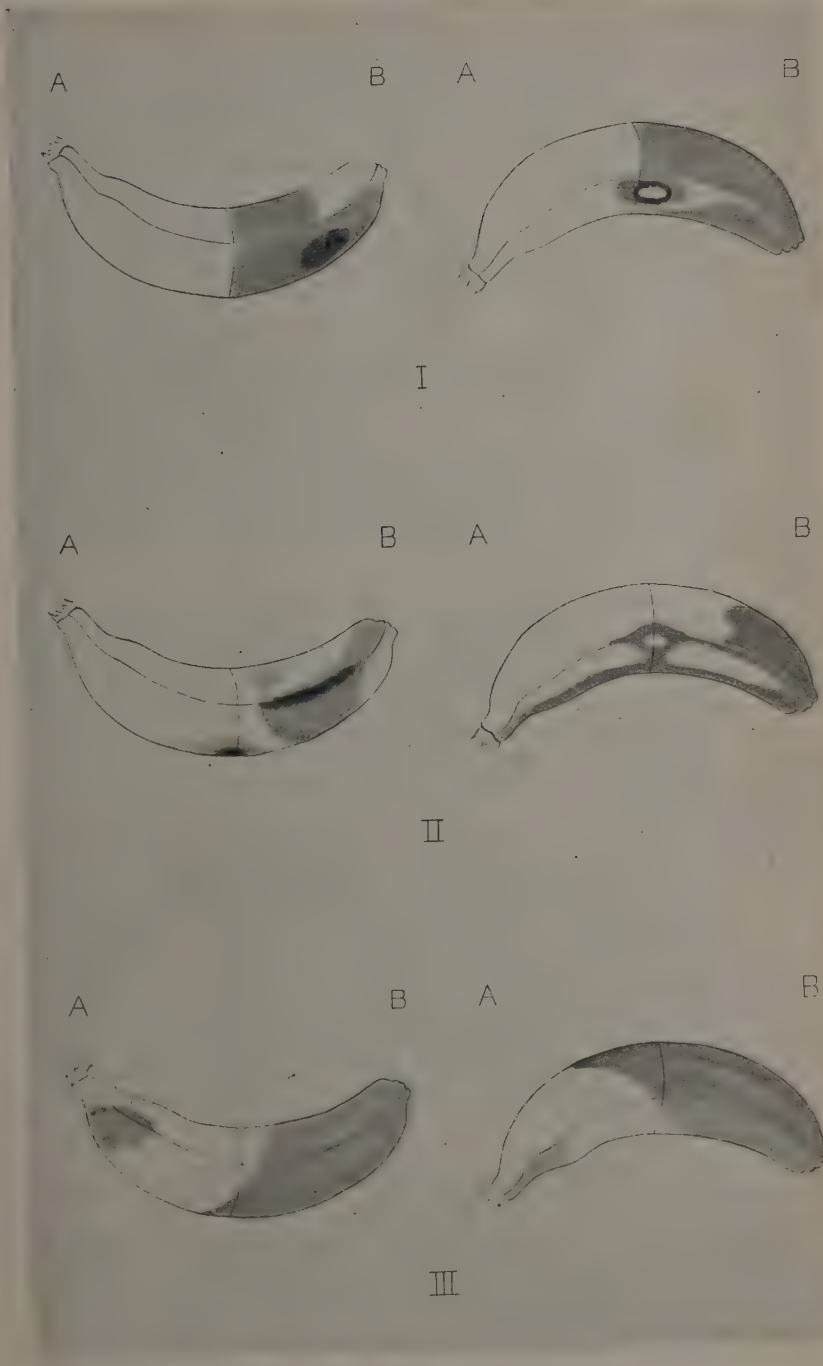

PLATE 2.

APPENDIX III.

THE UTILITY OF SULPHUR DUSTS.

Laboratory Experiments, 1929-30.

(*a*) Sublimed sulphur: Colonies were established on dusted fruits in confinement, 13th February, 1930. No obvious restriction on colony formation; little mortality during the first week and no inhibition of rust development. Eggs hatched normally after the usual period of incubation. After one month, the adults were dead but the colonies were intact, being made up of larvæ in the first introduced series and others hatched from eggs deposited in the fruit by introduced adults.

(*b*) Precipitated sulphur: Colonies were established on fruits, 18th March, 1930. Larvæ tended to wander from the fruit on to the glass, and all were dead within a week though some of the adults persisted. Eggs were laid by these, but none emerged except in the more lightly dusted fruits, where the increase in the larval population took place in the third week, *i.e.*, a fortnight after the same phenomenon in the checks. Rusting of any consequence took place only in the checks and lighter dusted fruits and then only towards the end of the observation period.

Preliminary Field Experiments, Edgehill, 1929-30.

(*a*) Sublimed sulphur, alone and in association with Cloudform tobacco dust, in proportions of 1 to 4. In the former no toxicity was observed, while in the latter case the effect was similar to that noted when the tobacco dust was used alone, *i.e.*, an immediate reduction in the existing thrips population followed by re-establishment some two or three weeks later from migratory individuals and young hatched from eggs in the fruit.

(*b*) Precipitated sulphur alone created conditions unfavourable to thrips activity on the bunch, hence the migratory but not necessarily fatal movements which follow dust applications. Adults showed a greater survival value than the larvæ, and egg-laying was not inhibited, though emergences did not take place as they otherwise did in the checks. In combination with tobacco dust in the proportions of 2 to 3, the thrips fauna was reduced to negligible proportions on the initial application. No trace of egg emergence at a later date. Reinfestation depended on the repopulation of the bunch some considerable time later. Normal emergences from the eggs took place towards the end of the observation period of five weeks.

Experimental material comprised 100 bunches in five rows, one of which was reserved for check observations.

It would appear from the above that the mixture of fine-grade precipitated sulphur with tobacco dust showed some possibilities for the control of the pest. Restocking of the bunch may occur from two sources, surviving adults or migratory forms from other parts of the plant. It appears that any eggs present in the fruit at the time of dusting, or laid shortly after dusting, do not hatch, or that the larvæ do not survive after hatching. Hence it must be supposed that adults which persist on the

dusted fruits continue to lay eggs, which first hatch successfully when the dust concentration falls below the toxic point.

Field Experiments, Little Mulgrave, 1930-31.

The plantation was located in the valley of the Little Mulgrave River, among the foothills of the fringing range on red volcanic soil. These soils carry a light rain forest. They possess little or no distinctive subsoil near the surface, and their moisture-retaining capacity is consequently low. At the inception of the work some 8 acres, planted in January, 1930, were coming into bearing, and actual observations extended from December, 1930, to June, 1931. The two areas selected for special treatments were chosen for their apparent uniformity. The aspect of the plantation was southerly and the general lay-out was as follows:—

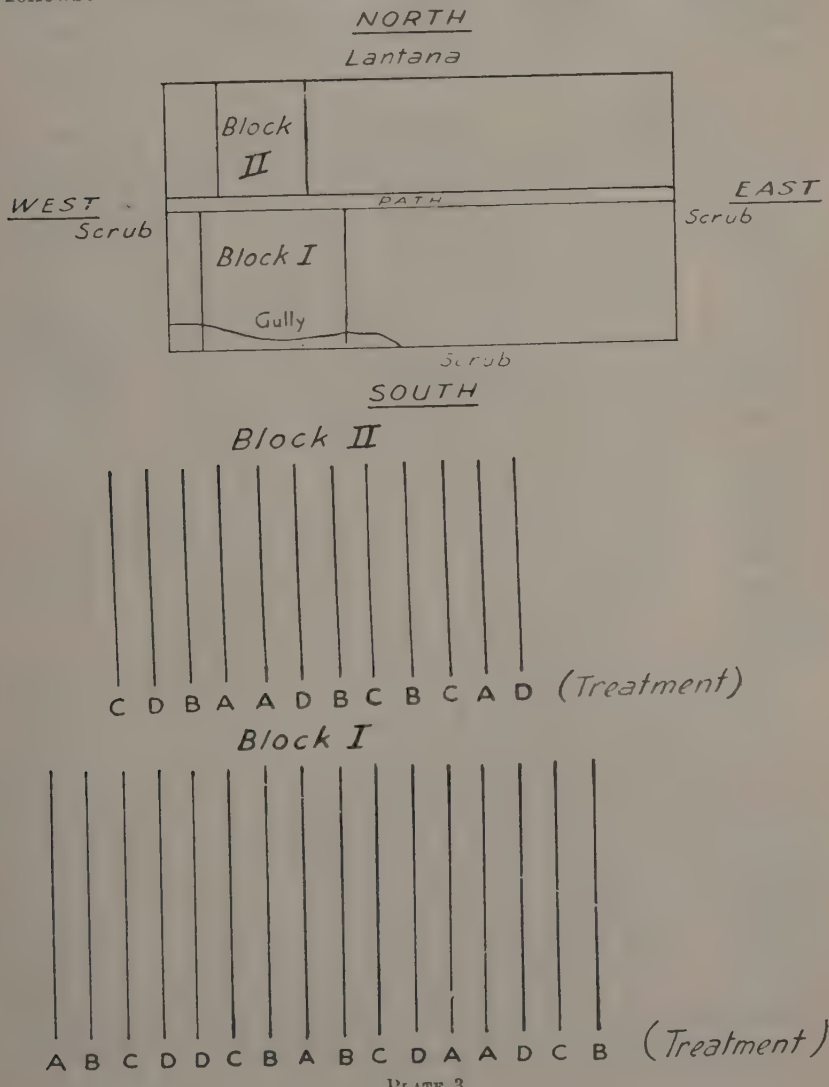

PLATE 3.

Treatments.—A: Precipitated sulphur; B: Check, untreated; C: Precipitated sulphur, plus Nicodust in proportions 1-2 respectively; D: Nicodust.

Block I.—Treated approximately at intervals of one week on the following dates:—December 16th, December 22nd, and December 30th, 1930; January 4th, January 12th, January 18th, January 26th, February 2nd, February 8th, February 15th, and February 21st, 1931.

Block II.—Treated approximately at intervals of two weeks on the following dates:—December 16th, and December 30th, 1930; January 12th, January 26th, February 8th, and February 21st, 1931.

In the following tables the date of bunching recorded is actually the date on which bunches thrown during the previous week were first marked. Bunches listed under "Pre. Dec. 10" were thrown earlier than December 3rd.

Block I.—Weekly Treatments.

Date of Bunching.	Nicodust.	Nicodust Precipitated Sulphur.	Precipitated Sulphur.	Check.
Pre—10 December	1·33 (9)	1·5 (16)	1·5 (16)	2·24 (25)
10 December	1·16 (6)	2·0 (9)	2·0 (6)	2·0 (5)
16 December	1·125 (8)	1·9 (8)	2·5 (6)	2·0 (5)
22 December	1·2 (5)	1·4 (7)	1·8 (5)	2·0 (9)
30 December	1·22 (9)	1·3 (7)	1·78 (9)	2·0 (8)
4 January	1·5 (8)	1·44 (9)	2·4 (10)	2·17 (7)
11 January	2·0 (2)	2·1 (7)	2·7 (7)	3·0 (12)
18 January	2·7 (10)	2·0 (3)	3·3 (3)	4·0 (2)
24 January	3·0 (4)	3·3 (3)	3·0 (2)	4·0 (5)
2 February	2·0 (1)	2·5 (2)	3·0 (1)	3·0 (2)
8 February	2·0 (1)	2·5 (2)	2·0 (2)	3·0 (2)
15 February	2·0 (2)	2·0 (2)	..	2·0 (1)

Values according to the scheme—A, 1; B, 2; C, 3; D, 4.

Numbers in brackets indicate the bunches thrown on the date cited and used in estimating the assigned value.

Block I.—Nicodust.

Date of Bunching.	Row 4.				Row 5.				Row 11.				Row 14.				Aggregates.			
	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
Pre—10 December ..	–	1	–	–	1	1	–	–	3	1	–	–	2	1	–	–	6	4	–	–
10 December ..	1	–	–	–	–	–	–	–	2	–	–	–	2	1	–	–	5	1	–	–
16 December ..	1	–	–	–	4	–	–	–	–	–	–	–	2	1	–	–	7	1	–	–
22 December ..	–	–	–	–	1	–	–	–	2	1	–	–	1	–	–	–	4	1	–	–
30 December ..	3	1	–	–	1	–	–	–	1	1	–	–	2	–	–	–	7	2	–	–
4 January ..	4	2	–	–	–	1	–	–	–	1	–	–	–	–	–	–	4	4	–	–
11 January ..	–	–	–	–	–	2	–	–	–	–	–	–	–	–	–	–	–	2	–	–
18 January ..	–	1	–	–	–	3	4	1	–	–	1	–	–	–	–	–	–	4	5	1
24 January ..	–	–	4	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4	–
2 February ..	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	1	–	–
8 February ..	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–
15 February ..	–	1	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	2	–	–
																	33	23	9	1

Assigned values—A, 1; B, 2; C, 3; D, 4. Total rust incidence, 110; number of bunches, 66; rust incidence per bunch, 1·7.

Block I.—Nicodust and Precipitated Sulphur, 2 : 1.

Date of Bunching.	Row 3.				Row 6.				Row 10.				Row 15.				Aggregates.			
	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
Pre—10 December ..	1	2	–	–	2	–	–	–	2	2	1	–	4	2	–	–	9	6	1	–
10 December ..	1	–	–	–	–	2	–	–	–	2	–	–	–	3	1	–	1	7	1	–
16 December ..	–	–	–	–	1	1	–	–	–	2	–	–	–	4	–	–	1	7	–	–
22 December ..	2	–	–	–	1	–	–	–	1	3	–	–	–	–	–	–	4	3	–	–
30 December ..	–	1	–	–	1	–	–	–	4	1	–	–	–	–	–	–	5	2	–	–
4 January ..	3	3	–	–	1	–	–	–	1	–	–	–	–	1	–	–	5	4	–	–
11 January ..	–	3	–	–	–	1	1	–	–	1	–	–	–	1	–	–	–	6	1	–
18 January ..	–	1	1	–	–	–	–	–	–	–	1	–	–	–	–	–	–	1	2	–
24 January ..	–	–	–	–	–	–	–	2	–	1	–	–	–	–	–	–	–	1	–	2
2 February ..	1	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	1	–	–	1
8 February ..	–	–	–	–	–	1	1	–	–	–	–	–	–	–	–	–	–	1	1	–
15 February ..	1	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	1	–	1	
																	27	38	7	3

Assigned values—A, 1; B, 2; C, 3; D, 4. Total rust incidence, 136; number of bunches, 75; rust incidence per bunch, 1·8.

Block I.—Precipitated Sulphur.

Date of Bunching.	Row 1.				Row 8.				Row 12.				Row 13.				Aggregates.			
	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
Pre—10 December ..	–	–	–	–	2	3	–	–	4	4	–	–	2	1	–	–	8	8	–	–
10 December ..	–	1	–	–	–	–	–	–	–	3	–	–	–	2	–	–	–	6	–	–
16 December ..	–	1	–	–	–	1	1	–	–	–	–	–	–	1	2	–	–	3	3	–
22 December ..	–	–	–	–	1	1	–	–	–	3	–	–	–	–	–	–	1	4	–	–
30 December ..	–	2	–	–	–	2	–	–	–	2	–	–	1	2	–	–	1	8	–	–
4 January ..	–	3	1	–	–	2	1	–	–	1	2	–	–	–	–	–	–	6	4	–
11 January ..	–	2	1	–	–	–	1	–	–	–	–	–	–	–	3	–	–	2	5	–
18 January ..	–	–	1	1	–	–	1	–	–	–	–	–	–	–	–	–	–	–	2	1
24 January ..	–	–	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	–
2 February ..	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	1	–
8 February ..	1	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	1	–
																	11	37	18	1

Assigned values—A, 1; B, 2; C, 3; D, 4. Total rust incidence, 143, number of bunches, 67; rust incidence per bunch, 2·1.

Block I.--Check Rows.

Date of Bunching.	Row 2.				Row 7.				Row 9.				Row 16.				Aggregates.			
	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
Pre—10 December ..	–	1	1	–	2	4	2	–	–	4	2	1	2	4	1	1	4	13	6	2
10 December ..	–	–	–	–	–	3	–	–	–	1	–	–	–	1	–	–	–	5	–	–
16 December ..	–	1	1	–	–	–	1	–	–	2	–	–	–	–	–	–	–	3	2	–
22 December ..	–	2	1	–	–	2	1	–	–	3	–	–	–	–	–	–	–	7	2	–
30 December ..	–	4	–	–	–	–	–	–	–	1	–	–	–	3	–	–	–	8	–	–
4 January ..	–	1	1	–	–	1	1	–	–	1	–	–	–	2	–	–	–	5	2	–
11 January ..	–	1	–	–	–	–	2	1	–	–	1	1	–	1	5	–	–	2	8	2
18 January ..	–	–	–	–	–	–	–	1	–	–	–	1	–	–	–	–	–	–	–	2
24 January ..	–	–	3	–	–	–	–	2	–	–	–	–	–	–	–	–	–	–	3	2
2 February ..	–	–	–	1	–	–	–	–	–	–	1	–	–	–	1	–	–	–	2	–
8 February ..	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	1	–	–
15 February ..	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
																	4	44	26	9

Assigned values—A, 1; B, 2; C, 3; D, 4. Total rust incidence, 206; Number of bunches, 83; rust incidence per bunch, 2·5.

Block II.—Fortnightly Treatments.

Date of Bunching.	Nicodust.		Nicodust Precipitated Sulphur.		Precipitated Sulphur.		Check.	
Pre—10 December	2·6	(39)	2·4	(36)	2·7	(38)	1·9	(32)
10 December	2·0	(6)	1·9	(16)	2·2	(18)	1·9	(15)
16 December	2·0	(4)	1·75	(4)	2·0	(4)	1·9	(8)
22 December	1·5	(8)	1·5	(2)	1·7	(7)	1·9	(7)
30 December	1·7	(10)	1·5	(13)	1·6	(10)	1·5	(8)
4 January	1·6	(7)	2·0	(10)	1·9	(9)	2·0	(7)
11 January	2·3	(6)	2·5	(4)	2·3	(7)	2·5	(2)
18 January	2·0	(2)	4·0	(1)	3·0	(5)	2·5	(2)
24 January	3·0	(5)	3·3	(3)	3·4	(5)	3·5	(2)
2 February	2·5	(2)	3·5	(2)	..		4·0	(3)
8 February	..		1·75	(4)	3·0	(1)	..	

Values according to the scheme—A, 1; B, 2; C, 3; D, 4.

The numbers in brackets indicate the bunches thrown on the date cited and used in estimating the assigned value.

Block II.—Nicodust.

Date of Bunching.	Row 2.				Row 6.				Row 12.				Aggregates.			
	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
Pre—10 December	1	4	1	1	1	10	3	7	–	5	4	2	2	19	8	10
10 December	3	–	–	1	–	–	–	1	1	–	–	–	4	–	–	2
16 December	1	–	–	–	–	1	–	–	–	1	1	–	1	2	1	–
22 December	1	3	–	–	3	–	–	–	1	–	–	–	5	3	–	–
30 December	1	1	–	–	–	–	–	–	2	6	–	–	3	7	–	–
4 January	2	–	–	–	1	2	–	–	–	2	–	–	3	4	–	–
11 January	–	3	–	–	–	–	–	–	–	1	2	–	–	4	2	–
18 January	–	–	–	–	–	–	–	–	1	–	1	–	1	–	1	–
24 January	–	–	3	–	–	1	–	1	–	–	–	–	–	1	3	1
2 February	–	–	–	–	–	–	1	–	–	1	–	–	–	1	1	–
													19	41	16	13

Assigned values—A, 1; B, 2; C, 3; D, 4. Total rust incidence, 201; number of bunches, 89; rust incidence per bunch, 2·3.

Block II.—Nicodust and Precipitated Sulphur, 2 : 1.

Date of Bunching.	Row 1.				Row 8.				Row 10.				Aggregates.			
	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
Pre—10 December	–	8	7	–	1	10	2	2	–	1	4	1	1	19	13	3
10 December	1	2	–	–	3	3	–	–	–	5	2	–	4	10	2	–
16 December	1	–	–	–	–	2	–	–	–	1	–	–	1	3	–	–
22 December	1	–	–	–	–	–	–	–	–	1	–	–	1	1	–	–
30 December	3	2	–	–	2	2	–	–	2	2	–	–	7	6	–	–
4 January	–	4	–	–	1	4	–	–	–	–	1	–	1	8	1	–
11 January	–	–	2	–	–	2	–	–	–	–	–	–	–	2	2	–
18 January	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	1
24 January	–	–	–	–	–	–	–	–	–	1	1	1	–	1	1	1
2 February	–	–	–	1	–	–	1	–	–	–	–	–	–	–	1	1
8 February	–	–	–	–	–	–	–	–	1	3	–	–	1	3	–	–
													16	53	20	6

Assigned values—A, 1; B, 2; C, 3; D, 4. Total rust incidence, 206; number of bunches, 95; rust incidence per bunch, 2·2.

Block II.—Precipitated Sulphur.

Date of Bunching.	Row 4.				Row 5.				Row 11.				Aggregates.			
	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
Pre—10 December	1	9	6	2	–	4	3	4	1	2	3	3	2	15	12	9
10 December	–	8	2	1	–	3	–	–	1	3	–	–	1	14	2	1
16 December	–	1	–	–	–	2	–	–	–	1	–	–	–	4	–	–
22 December	–	3	–	–	2	1	–	–	1	1	–	–	3	5	–	–
30 December	–	1	–	–	–	3	–	–	4	2	–	–	4	6	–	–
4 January	1	2	–	–	1	1	1	–	–	3	–	–	2	6	1	–
11 January	1	1	2	–	–	1	1	–	–	1	–	–	1	3	3	–
18 January	–	–	–	–	–	1	1	1	–	–	2	–	–	1	3	1
24 January	–	–	1	–	–	–	2	1	–	–	–	1	–	–	3	2
2 February	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
8 February	–	–	–	–	–	–	1	–	–	–	–	–	–	–	1	–
													13	54	25	13

Assigned values—A, 1; B, 2; C, 3; D, 4. Total rust incidence, 248; number of bunches, 104; rust incidence per bunch, 2·4.

Block II.—Check Rows.

Date of Bunching.	Row 3.				Row 7.				Row 9.				Aggregates.			
	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
Pre—10 December	–	4	2	–	2	9	3	–	1	6	4	1	3	19	9	1
10 December	1	5	1	–	1	3	–	–	1	2	1	–	3	10	2	–
16 December	1	2	–	–	–	3	–	–	–	2	–	–	1	7	–	–
22 December	2	1	–	–	–	1	–	–	–	3	–	–	2	5	–	–
30 December	1	1	–	–	2	3	–	–	1	–	–	–	4	4	–	–
4 January	–	3	–	–	–	3	–	–	–	1	–	–	–	7	–	–
11 January	–	1	–	–	–	–	1	–	–	–	–	–	–	1	1	–
18 January	–	1	–	–	–	–	1	–	–	–	–	–	–	1	1	–
24 January	–	–	–	–	–	–	–	–	–	–	1	1	–	–	1	1
2 February	–	–	–	1	–	–	–	–	–	–	–	2	–	–	–	3
													13	54	14	5

Assigned values—A, 1; B, 2; C, 3; D, 4. Total rust incidence, 183; number of bunches, 86; rust incidence per bunch, 2·1.

APPENDIX IV.

Modifications of the Dusting Apparatus.

The dusting of the banana bunch presents problems quite different from those associated with the treatment of other crops. With the banana bunch the object to be dusted is at or about chest level, and the dust must be applied from all sides if the various faces of the bunch are to be covered. The operator himself cannot very well move round the bunch, and has therefore to project the dust towards himself when treating the fruit furthest away from him. This is practicable with small plunge dusters, but these, though perhaps suitable for small areas where time and convenience are of small moment, are quite inadequate for general plantation use. Large rotary dusters provide very satisfactory motive power, but most makes on the market have a rigid arm made up of sectional tubes which fit into one another. Some have a semi-flexible feed arm, but the construction is heavy.

For the banana bunch treatment, the duster requires adequate motive power and a feed arm which can be readily manipulated by the operator. In the rotary duster available, the feed arm consisted of three sections fitting into one another. The first two of these were dispensed with in the modification, and a specially prepared flexible tube made of duck and supported by a spiral steel wire was substituted. The length of the flexible tube was kept at a minimum—in practice some 15-18 inches.

The procedure is simple. Either 12 or 14 gauge steel wire is carefully twisted round an inch bar carried on the frame of a lathe in such a way that neighbouring coils touch each other. When a coil of some 8 inches is wrapped round the bar, it is liberated with the greatest possible care. When relaxed the steel wire cylindrical spring has a diameter of 1¾ inches. The ends of the spring are pulled apart until adjacent coils are ¾ inch apart, and trimmed to a length of 15-18 inches. A sleeve is made to fit the spring, heavy duck or some similar material sufficiently strong to stand the strain of constant use in the plantation being suitable. The free ends are then clamped in position, one to the hopper of the duster, the other to the last section of the rigid feed arm, this and the fishtail feed being retained in the modified apparatus.

In operation, the rigid section is held in the left hand, and can be manipulated at will, the dust charge being applied to the various parts of the bunch with the minimum inconvenience.

SEASONAL GREETINGS ACKNOWLEDGED.

Seasonal greetings have been received by the "Queensland Agricultural Journa" from the "Courier-Mail," Brisbane; "The Producers' Review," Toowoomba; "The Fruit Culture," Agricultural Press, Ltd., Sydney; State Service Union; F. M. J. Baker, M.P.; Australian Broadcasting Commission; "Rosewood Register"; "Monto Herald"; Queensland Forestry Department; St. Joseph's College, Nudgee; Queensland Co-operative Bacon Association, Ltd., Murarrie; and numerous readers in different parts of Queensland and in other States of the Commonwealth and Mandated Territories. All greetings are warmly acknowledged and cordially reciprocated.

Australian and European Bacon.

By E. J. SHELTON, H.D.A., Senior Instructor in Pig Raising.

WITH a view to affording pig raisers and trade representatives in Queensland opportunity of making a detailed comparison of the commercial quality of Australian and European bacon, the Royal National Agricultural Association of Queensland, at the recent Brisbane Exhibition, staged a display of bacon sides, such as find ready sale on the markets of the United Kingdom, where bacon and other pork products from European countries vie with home-grown products and those of the dominions for first place in the trade.

The illustrations show the sides as they were on view at the pig section of the exhibition. Following are the weights from London, as supplied by the Farmers' Co-operative Distributing Association, Limited, Brisbane, who imported the sides on behalf of the Royal National Association. The sides were smoked at Murarrie:—

WEIGHT OF SIDES FROM LONDON.

Origin.	London Invoice Weights.	Weights when Unpacked.	Smoked Weights.
	Lb.	Lb.	Lb.
Ireland	53	50½	49
Sweden	58	54½	52½
Canada	46	43	40
Poland	56	51	49
Denmark	60	55	53
Holland	59	54½	53

The Queensland sides averaged 45 lb. smoked weights.

All the sides received similar treatment in the final stages of preparation. After being cured, the imported sides were dispatched in a frozen condition, referred to in the trade as green or unsmoked bacon—i.e., bacon that has been salted and cured, but not finally washed, dried, smoked, polished, and prepared for market.

The imported sides were thereafter subjected to these processes at the Murarrie Bacon Factory, and were finally delivered at the Exhibition, along with typical Queensland sides kindly lent for the purpose by Foggitt, Jones, Proprietary, Limited, J. C. Hutton Proprietary, Limited, and the Queensland Co-operative Bacon Association, Limited, of Brisbane.

An endeavour was made to display Queensland sides of similar weight, conformation, and condition so that a fair comparison could be made, and these are illustrated along with Irish and Canadian sides—Australia's keenest Empire competitors on the markets of the old world—Swedish, Dutch, Polish, and Danish sides of average commercial quality are also illustrated. To enable a further and more minute examination to be made, the sides were cut and the cut portion of one of each of the flitches is shown.

PLATE 4.—QUEENSLAND BACON.

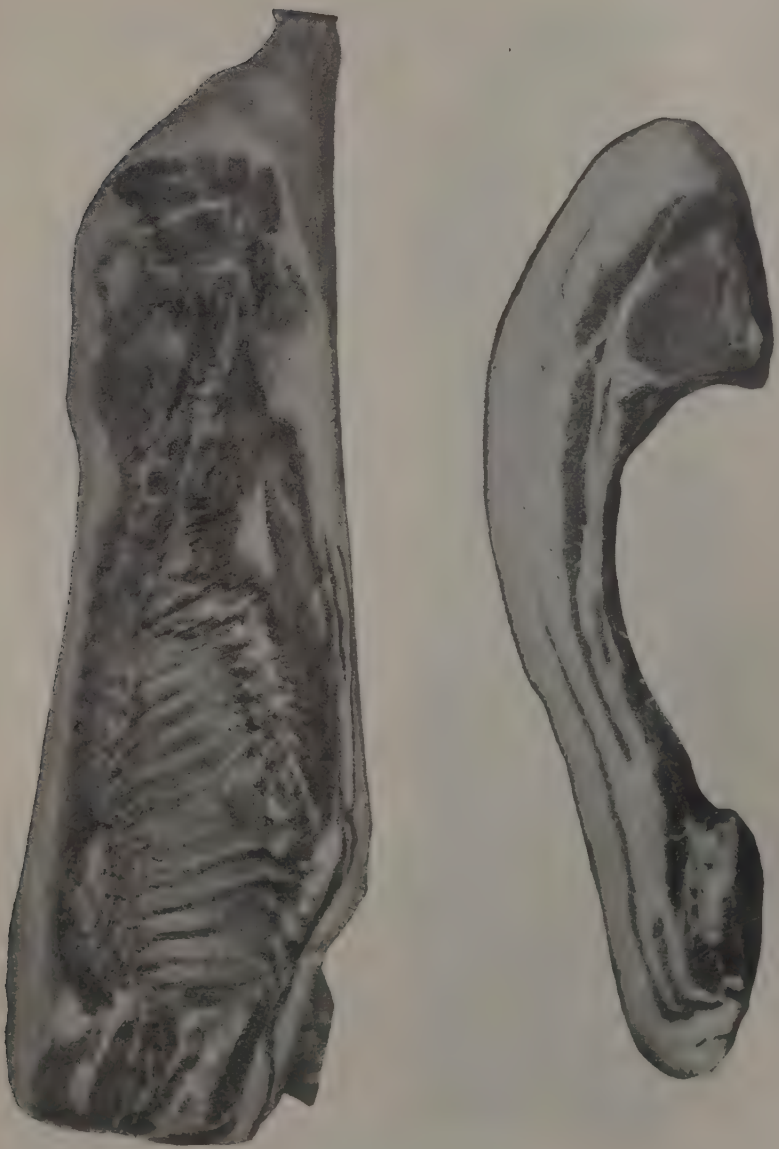

PLATE 5.—QUEENSLAND BACON.

PLATE 6.—QUEENSLAND BACON.

PLATE 7.—DANISH BACON.

PLATE 8.—POLISH BACON.

Advices received from Great Britain in connection with consignment indicated that it was not possible to obtain bacon sides of Argentine or United States of America manufacture, as those countries are no longer sending Wiltshire long sides to Britain; nor was it possible to obtain Latvian sides, as they were not represented on the Smithfield markets.

Comment.

It was ascertained that, in regard to the Polish bacon, the feeds used in the production of the bacon sides shown included potatoes, barley, rye, and dairy products and, in smaller quantities, household refuse—all suitable for use in rations for the production of bacon pigs. In Poland, maize is used only in exceptional cases, and then exclusively in the southern districts of that country. The curing process for Polish bacon is strictly in accordance with requirements of the British Ministry of Agriculture and Fisheries. Polish pigs consist almost entirely of three groups—Landrace, improved pigs, and purebred pigs—the production of which depends on the import of stud stock from England and Germany according to breeds. The good points of the Polish Landrace is their resistance to unfavourable conditions and great fertility. As for pedigree pigs used in Poland, first place is occupied by the British Large White, and next by the German White Pointed Ear Pig (Deutsches Edelschwein). There are not many Berkshires, Large Blacks, or Westphalian pigs.

Danish Pigs.

The characteristic feature of the production of pork in Denmark is the close association of pig breeding with dairy farming. The various by-products of the dairy—skimmed milk, butter milk, and whey—are used in the feeding of pigs to the utmost extent possible, and milk is so far recognised as a basic food for pigs that its use is almost entirely regarded as obligatory. Practically all Danish farmers use cereals and milk as the sole food of the young animals. If grain prices are high, part of the cereals may be replaced by such feeds as potatoes, sugar beet, swedes, &c., but this is usually of advantage to the quality of the pork, a moderate quantity of root crops having a favourable effect on the fattening. Unduly large quantities of sugar beets and swedes may have the effect that the flesh acquires an unfavourable (soft) consistence, but as this feeding is quite uneconomical, and as the pigs are paid for according to the quality of the pork, the risk of an exaggerated use of these foodstuffs really does not arise in actual practice.

Denmark uses principally the Large White Yorkshire breed crossed with the native Landrace.

Swedish Pigs.

In Sweden pig feeding is carried on for the most part on small farms and decreases regularly with increased acreage. Next to butter, bacon is the most important article of Swedish exports in animal products. The little pigs are first supplied with other food while still suckling. For this purpose they are admitted to a smaller sty at the side of that of their dam, where they are given whole barley or rye, and later on warm fresh skim milk in small quantities. At the age of from six to seven weeks of age, the pigs are weaned. During the first weeks of transition (i.e., after weaning) fresh lukewarm cow's milk is substituted for the sow's milk. Considerable attention is paid to the cleaning of the

Plate 9.—Irish Bacon.

PLATE 10.—SWEDISH BACON.

PLATE 11.—DUTCH BACON.

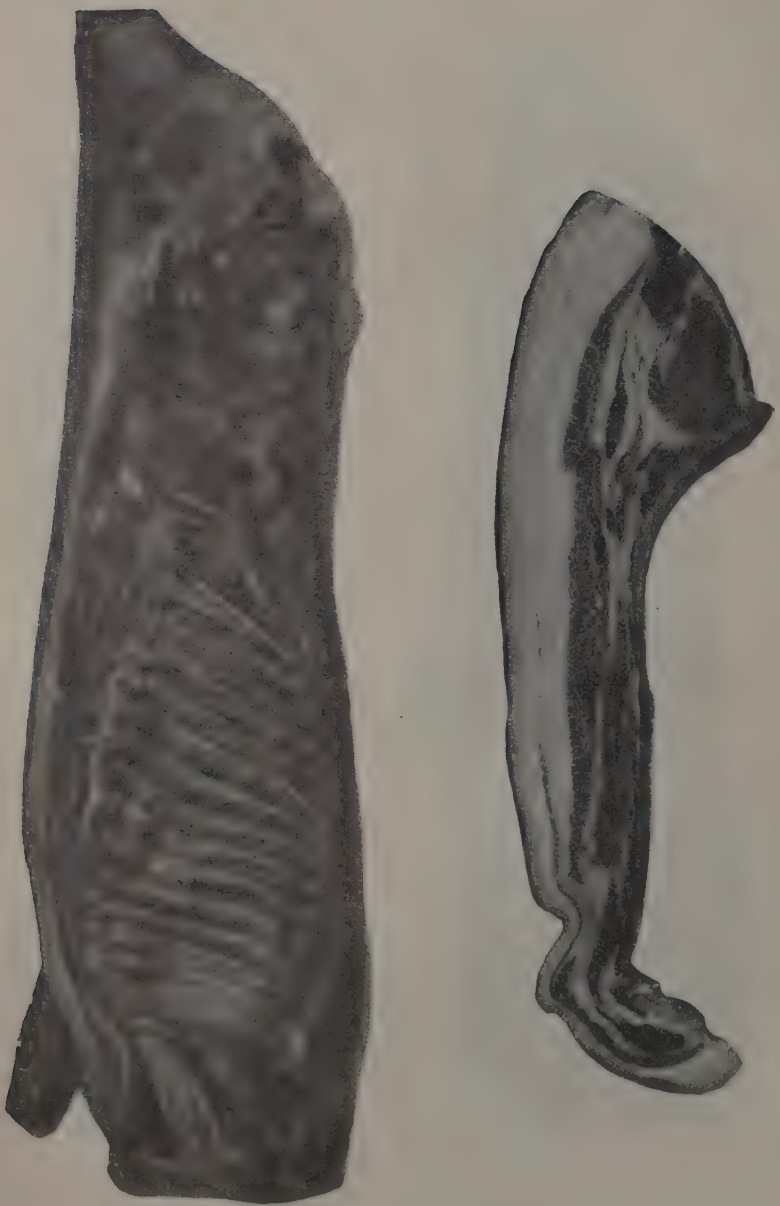

PLATE 12.—CANADIAN BACON.

troughs in order to avoid souring the food. Having reached the age of eight to ten weeks, the little pigs receive crushed or ground corn instead of whole cereals. In addition, roots or boiled potatoes often form a part of the rations. The feeding of breeding animals is given special attention.

The most prominent of the breeds used is the Large White Yorkshire, the prevailing breed in Sweden now. These and the Swedish Landrace are crossed together with excellent results. The general pig industry of the country has been largely influenced during the last decade by breeding animals emanating from breeding stations for the Large White. In this way, by means of pure breeding and very frequent cross-breeding, the Large White has influenced to a larger degree the present stock of the country. The Swedish Landrace has been developed on exactly the same lines as the Danish Landrace, with which it is closely related.

In the Netherlands.

Similar conditions prevail in the Netherlands and Holland where the Netherlands Bacon Control Office exercises a considerable influence on pig raisers.

In Canada.

Canadian Hog Grading Regulations have also largely influenced the breeding of pigs in Canada. The use of home-grown grains is recommended for the production of select bacon pigs, especially as export and domestic markets demand the production of the select bacon and bacon grades of pigs. The premium of one dollar per pig for select bacon pigs is an additional substantial profit, encouraging the farmer to produce and market the best stock possible.

In Ireland.

As is well known, some of the best pigs in the world are produced in Ireland. Irish bacon has an excellent reputation on the markets of the United Kingdom. There nothing is too good for the pig. This is in striking contrast with the keeping of pigs under rough and unhygienic conditions conducive to disease, slow growth, and no profit. In Ireland, also, the white breeds are very popular, the Large and Middle Whites being largely used on stock of local production. Milk, barley, and potatoes are foods in everyday use, while the strictest attention is given to systems of feeding and management.

COMMENT ON BACON EXHIBITED.

Points to be Noted.

It will be noted that some of the sides exhibited are of greater length than others; a closer examination will reveal that this increased length is due to an increased number of ribs. As a result of observation of a large number of pig carcasses, Professor A. M. Shaw, a noted American scientist, has shown that there is considerable variation in the number of pairs of ribs in pigs. The normal number is fourteen pairs. In some of the sides illustrated, sixteen ribs are present. Professor Shaw has observed 3,957 animals, with the following results:—20 animals had thirteen pairs of ribs each, 1,574 had fourteen pairs each, 1,829 had fifteen pairs each, 310 had sixteen pairs, and 7 had seventeen

pairs each. The remainder showed uneven pairs or floating ribs. No normal litters were found where all the pigs possessed the same rib numbers.

It is possible there is room for much research work in connection with the length of side of the pig. It might be noted that in the butchering of the sides for bacon curing, the first pair of ribs—one on each side—is invariably removed, this being a recognised practice in the trade.

It will be noted further that all sides show a reasonable uniformity in width. All the imported sides have the aitch bone removed exposing the knuckle joint in the ham. They also have the shoulder blades removed, as is required in the Wiltshire long side trade. The Queensland sides have not been dealt with in this way, as neither aitch bone nor shoulder blade is removed in curing bacon in this country.

All the sides except the Canadian carry a similar proportion of back fat, the Canadian was considered by most of those qualified to speak as being altogether too thin for best trade requirements. Actually, it cut out equal to the best, a point not to be overlooked now that the demand is for a long, lean side with a minimum of fat. Possibly it was for this reason that the Canadian side darkened more in the smoking process than the other sides. The Irish side was definitely too fat, even for the best English trade. The European sides were all typical, Swedish and Dutch sides being superior to the Polish and Danish.

The Queensland sides were very satisfactory, and on the whole made an excellent showing. Unfortunately, however, we have no record of the breed or cross represented by these sides.

The display generally was highly educational, and emphasised the importance of extension work in learning exactly what overseas markets require.

Queensland representatives who examined the sides felt that, while there is considerable room for improvement here, we are on the right lines, and now that a definite move has been made to prepare for an extensive overseas trade, such questions as length and leanness of side, uniformity, freedom from blemish, and production at a cost that will allow of a reasonable margin of profit become all the more important.

If you like this issue of the Journal, kindly bring it under the notice of a neighbour who is not already a subscriber. To the man on the land it is free. All that he is asked to do is to complete the Order Form on another page and send it to the Under Secretary, Department of Agriculture and Stock, together with a shilling postal note, or its value in postage stamps, to cover postage for twelve months.

The House Fly.

By J. A. WEDDELL, Assistant Entomologist.

THE house fly, *Musca domestica* Linn., may be rated amongst the most common insect associates of man, but familiarity with this insect has been accompanied by a corresponding ignorance of and indifference to the dangers to health that are associated with its presence. However, there is now an awakening to this danger the reality of which is indicated by the fact that the names "disease carrier" and "typhoid fly" have been suggested as substitutes for the somewhat innocent-sounding name of "house fly." This article discusses briefly the life-history and habits of the house fly, and points out the various recognised measures which may be adopted for its control.

Distribution.

The house fly is widespread throughout the world; it is present in every continent, and has been found not only in the tropical and temperate zones, but even in subpolar regions such as Lapland and Finland. Not merely is the fly widespread, but, given suitable conditions, it is capable of breeding to enormous local populations.

Life-cycle Stages.

The eggs are tiny white objects, somewhat banana-shaped and about one-twentieth of an inch in length. (Plate 13; fig. 1.)

The larva or maggot (Plate 13; fig. 2) is slender, white, and shining, and is about one-twelfth of an inch long when it hatches. The body thickens from a narrow-pointed head to a blunt and rounded anal segment. When full grown the length has increased to almost half an inch, and the colour gradually changes to a creamy shade. During the growth period the larva moults twice.

The pupal stage of the insect is passed within the final larval skin, which envelopes the insect and contracts and hardens into a cylindrical-shaped puparium with rounded ends. The colour deepens to dark-brown. The puparium is approximately one quarter of an inch in length (Plate 13; fig. 3).

A detailed description of the adult fly is rendered needless both by familiarity and because of the accompanying illustration (Plate 13; fig. 4). It is necessary to refer to only a few structures. The mouth-parts (Plate 13; fig. 5) are wonderfully complex, with a proboscis capable of extrusion for the purpose of sucking liquid food. It is incapable of piercing or chewing, but solid foot such as sugar is first dissolved by a flow of saliva and the resultant solution is then sucked up.

The tarsal joints of the legs constituting the feet are well adapted for walking either vertically or upside down on smooth surfaces. The terminal joint (Plate 13; fig. 6) has, besides two claws, two sticky pads covered with very fine hairs and furnished with glandular openings from which there exudes a sticky fluid.

The legs and body of the fly are clothed in fine hair-like spines which make the lodgment of contaminating particles almost inevitable.

PLATE 13.—HOUSE FLY (*Musca domestica* Linn.).

Fig. 1.—Eggs × 15.
Fig. 2.—Larva × 5.
Fig. 3.—Puparium × 5.
Fig 4.—Adult × 5.
Fig. 5.—Proboscis × 34.
Fig. 6.—Foot showing claws and pad × 34.

Life-history.

The eggs are laid in batches of about 110 to 150 eggs, in fresh manure, garbage, fæces, and decaying vegetation. They hatch usually in from 8 to 24 hours, the time varying with the temperature.

The larvæ or maggots may be found in squirming masses within a few inches of the surface of infested material, but if the material is soft and moist and not subject to excessive internal heating, the maggots may penetrate throughout. At the end of about five days in warm weather the maggots achieve full growth, and they move then to a suitable spot in which to pupate, the ideal site for pupation apparently being moderately damp soil giving easy penetration. Pupation may occur at depths varying from little more than 1 inch to 2 feet, the latter being recorded in sandy loam.

The pupal period lasts approximately three to five days in warm weather, but great variation in this period may occur according to the temperature conditions, development being slower with low temperatures.

This period constitutes the time during which the marked change from larva to adult is taking place, and it is terminated by the complete development and the emergence of the adult insect. The adult fly commences to feed soon after emergence, but egg-laying does not occur until after a lapse of ten days to a fortnight. It will be seen that a complete generation from egg-laying to egg-laying may occupy only a little over three weeks in warm weather.

Habits and Menace of the Adult Fly.

In the matter of food, the house fly has most varied tastes; moist garbage and horse manure are just as attractive as man's most carefully refined food. Further, it is essential for the fly to visit putrefying material in order to lay its eggs. As has been pointed out, contaminating material will be caught in the hairs clothing the body, and on the claws and sticky pads of the feet, and on the extruded tongue. These, taken together, constitute only one section of the danger, however. It has been definitely proved that viable bacteria capable of causing human diseases, such as typhoid and tuberculosis, among many others, may be recovered from the alimentary canal of the house fly several days after infection. This means that the familiar fly specks are potentially infective material.

Natural Control.

The fluctuations in the number of flies are largely due to variations in temperature. The high summer temperatures induce rapid breeding, and if they are accompanied by high humidities, then the breeding sites are kept suitably moist. Low temperatures increase the length of the developmental period, thus slowing up the rate of breeding, and at the same time rendering sluggish the adult flies that are present.

The house fly is subject to attack by parasitic organisms, the most notable being the fungus *Empusa muscæ* Cohn. The spores of this organism give rise to a growth of white fungus which ramifies and distends the body of the insect. Swollen, sluggish, and dead house flies will probably often have been observed by householders. The effects of the fungus are most marked in the late summer and autumn months, when large numbers of the flies are killed in this manner.

Spiders and various predatory insects such as mantids, robber flies, and wasps of various families, all take their toll of the adult house flies.

The eggs, larvæ, and pupæ are liable to attack from insects such as ants and ground beetles.

Artificial Control.

The artificial control of the house fly and the elimination of danger from it may take a threefold form:—(*a*) Exclusion; (*b*) elimination of breeding sites; (*c*) destruction of the adults.

Exclusion.

Infants and patients should be protected from the attentions of flies by mosquito nets or other comparable means of exclusion. Foodstuffs and cooking utensils should be adequately covered and suitable gauze-screened cupboards should be provided for fresh foods. Infants' food, feeding bottles, milk, and so on should be most carefully protected. In cases of severe and more or less permanent infestation of buildings by flies, serious consideration should be given to the complete screening of all doors and windows.

Elimination of Breeding Sites.

With the growth of motor transport, the number of stables in city areas tends to decrease, and in those that remain the breeding of flies is now less possible than formerly because stable owners must take suitable precautions to prevent accumulations of manure.

There are, however, instances where manure must be stored for short periods, and it has been found that heaps of manure, if closely packed, become so heated by the processes of fermentation and permeated by the resultant gases that fly-breeding is restricted to the outermost layer of an inch or so. The heaps should be formed into a compact, almost rectilineal shape, and carefully smoothed on the sides and top by blows with the back of a shovel. The use of a borax spray composed of 1 lb. of borax in 6 gallons of water will satisfactorily deal with the insects breeding in the outer layer. As excess borax in the soil is injurious to plant growth, it has been recommended that not more than three gallons of this spray should be applied to 10 cubic feet of infected manure, and not more than 15 tons of borax-treated manure per acre be distributed in the soil.

For mounted army forces and farms, the method of drying manure may be useful. The process simply consists of spreading the manure in a thin uniform layer so that it dries quickly in the sun, thus rendering it unsuitable to the fly for oviposition. An area of flat hard ground should be selected and a rotation of freshly-placed manure, dry manure, and bare ground could be kept up in order to deal with fresh accumulations. The drying manure should be raked over. When dried the manure could be stored safely for agricultural purposes. It will be understood, however, that manure dried in this manner would have a diminished fertilising value, and it would be useful mainly because of the humus it would provide.

In city areas, the control of the house fly generally depends on the care taken in garbage disposal, and garbage should accordingly be placed in a fly-proof garbage tin. Regulations regarding the building

and care of household conveniences are in force, and each householder should see that so far as he is concerned, the regulations are strictly obeyed.

Destruction of the Adults.

The adult flies that gain access to a building may be dealt with in a variety of ways, as for example swatting, the use of sticky fly-papers, fly sprays, and trapping.

There are several brands of fly sprays on the market, and these generally consist of definite contact insecticides, which kill either on actually wetting the insect or as partial fumigants as a result of the fumes that are liberated when the fluid is sprayed in a fine mist.

A home-made spray may be somewhat inexpensively prepared by stable owners and farmers. The recipe is as follows:—½ lb. of pyrethrum is stirred into 1 gallon of kerosene and the mixture is agitated at intervals for two hours. Settling is then allowed to take place and the resultant clear amber-coloured fluid is later decanted or syphoned off. This spray fluid, if prepared with water-white kerosene, may be safely sprayed in furnished rooms. Householders, however, will usually find it more convenient to purchase one of the ready-prepared sprays.

It is advisable to sweep up and burn the flies that fall as a result of spraying, as a number of them may merely be stupified and, if left, may later recover.

Traps of a multiplicity of designs have been used for house fly control, the most commonly known type being the glass bottle trap with the entrance in the bottom and with an internal trough. The trough holds a fluid which serves both to lure the flies into the trap and also to drown them. Various fluids may be used for baiting this style of trap, including milk and stale beer.

Trapping should, however, be a somewhat needless procedure, or at least it is a method to be adopted only as a last resort. If flies are sufficiently numerous in a building to warrant the use of traps, then all efforts should be directed to the elimination of the source of the flies and, if necessary, to the adequate screening of the building.

TO SUBSCRIBERS—IMPORTANT.

Several subscriptions have been received recently under cover of unsigned letters. Obviously, in the circumstances, it is impossible to send the Journal to the subscribers concerned.

It is most important that every subscriber's name and address should be written plainly, preferably in block letters, in order to avoid mistakes in addresses and delay in despatch.

Worms in Sheep.

A NEW AUTOMATIC DRENCHER.

Drenching sheep for worms has become so general in parts of Queensland that people using their ingenuity to simplify the operation deserve every possible encouragement. There has been invented an improved gun called the P. D. J. Automatic Gravity Drencher, which gives every satisfaction. The gun is simple in construction, and does its work well. The feed is by gravitation. Subjoined is a description of the new drencher, which is sure to interest sheep men, especially those engaged in lamb-raising.—Ed.

A NEW type of drenching gun for the treatment of worms in sheep is now on the market, and its efficacy has been proved by a comprehensive series of practical demonstrations. Officers of the Sheep and Wool Branch are impressed with its usefulness as an essential part of the ordinary veterinary equipment of a well-managed sheep farm, especially in those districts where lamb-raising is extensively practised.

The new gun is the invention of a veterinary surgeon, and is an improvement on any model so far used in Queensland. It is entirely a Queensland invention and product manufactured in Brisbane. The complete outfit consists of a nickel-plated copper container, a connecting tube, and the gun itself. The container is sold in two sizes, one holding half a gallon and fitted with a flexible tubing, and the other holding a gallon fitted with a rubber hose connection. In the design special attention has been given to the filter caps and shut-off taps. The aim of the designer was to evolve an instrument scientifically accurate, with the force of ejection controlled by trigger pressure, and in this he has succeeded. The gun recharges automatically on the release of the trigger and a fresh dose is sucked in to an accurately adjustable quantity. The dosage is regulated by means of a knurled screw-head at the butt of the gun—a simple arrangement by which an accurate dosage may be administered to the affected sheep.

The registered name of the new outfit is the "'Ject-in' Sheep Drenching Gun," otherwise known as the "P.D.J. Automatic Gravity Drencher." The smaller size is intended for the administration of carbon tetrachloride or tetrachlorethylene and has a dosage range of from five to ten cubic centimetres. The larger size is designed for the administration of copper sulphate or arsenical drenches, and can be adjusted easily to a dose of either one or two ounces.

The new drencher combines the two essential features of such an apparatus—accurate dosage and ease of use. Altogether the "Ject-in" gun is one of the most satisfactory we have yet seen for the purpose of drenching sheep, and its low cost is a further recommendation. Summed up, its chief points are accuracy, efficiency, and cheapness.

Details of the New Drencher.

The new gravity drencher consists of a brass cylinder of accurate capacity, with a suitable nozzle at one end, for inserting in the sheep's mouth, and, at the other end, an inlet tube for connecting the drencher

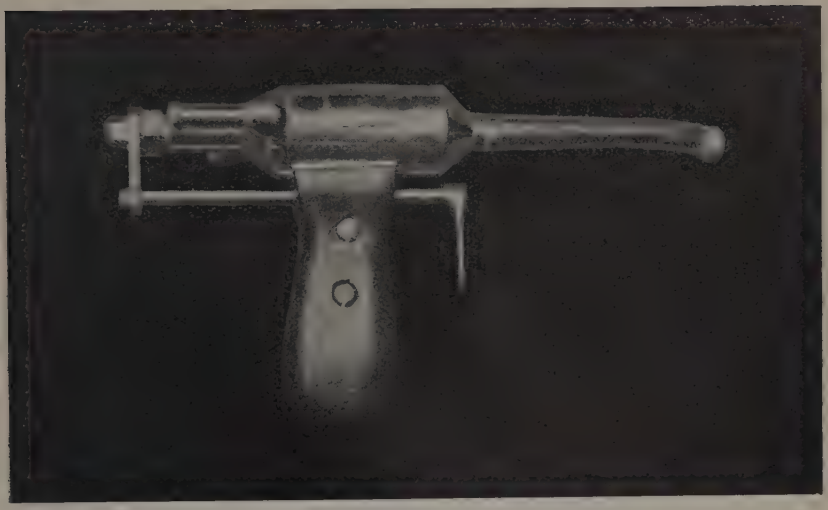

PLATE 14.

The "Ject-In" Sheep-drenching Gun—A new automatic apparatus of Queensland invention and manufacture.

PLATE 15.

Knapsack container for the "Ject-In" Drencher for sheep.

to a suitable reservoir. Beside the inlet tube is a double acting air valve, which allows the air to be expelled from the cylinder when filling, and allows the air in, to deliver the dose.

The drencher has a pistol grip fitted on side of the cylinder, with a trigger attached to a rod moving parallel to the axis of the cylinder. This rod is connected in turn to the valve spindle, which with the valves works through the central axis of the cylinder. The valve spindle actuates both the inlet and outlet valves, which are so arranged that, normally, the inlet valve is opened and the outlet valve is closed and held in that position by a spring. On pressing the trigger against the spring the inlet valve is closed first and then the outlet valve opens to deliver the dose. The outlet valve cannot open before the inlet valve is closed, so it is impossible to get an overdose. On releasing the trigger the valves return to normal.

It should be noted that the gravity supply of the drench to the sheep refers only to the dose itself (1 or 2 oz.) and has no bearing on the supply in the reservoir as that is cut off immediately the inlet valve is closed, and only the dose itself runs into the sheep's mouth by gravity. In this way the drencher functions perfectly, with a full reservoir down to the last dose in it. All metal parts of the drencher are of brass, nickel-plated, and will withstand any chemical action due to the drench in use.

The drenching outfit generally supplied consists of two separate drenchers—1 and 2 oz. respectively for lambs and sheep, a 1-gallon reservoir (made of brass) with straps to hold it on the operator's back, and length of suitable hosing to connect the drenchers with the reservoir.

The drenchers are of simple construction, with no parts to get out of order, very strong, and guaranteed to stand a fair amount of rough usage—but not abuse. The new gun is very fast in action, in fact a 1-oz. drencher can be used on sheep, if necessary, by simply pressing the trigger twice. It can be easily cleaned by flushing with hot water. The drencher is so constructed as to withstand the corroding influences of bluestone and arsenic, and with ordinary use should last a lifetime with minor replacements.

In operation a knapsack is carried on the back and a handy length of hose piping conveys the drench to the gun. The grip is a good one, and just sufficiently strong to release the dose as slowly or quickly as desired. The mouthpiece is sufficiently bent to make the actual operation of drenching convenient.

The gun is constructed to administer a 1 and 2 oz. drench.

The gun has been tested carefully in the matter of correctness of dose. In use the apparatus proved handy and efficient, and may be regarded as a labour saver in no small degree. Moreover, its price is reasonable.

Banana Weevil Borer Control.

By J. A. WEDDELL, Assistant Entomologist.

THE present seems to be a suitable time at which to restate the position regarding the methods of control of the banana weevil borer. Permits for the planting of a large number of suckers have been issued, new districts are being opened up, and new growers are entering the industry. For his own sake, each grower must keep his plantation in a clean and healthy condition; if he does not do so, then steps will be taken to ensure the protection of neighbouring growers.

Essentially satisfactory control of the banana weevil borer depends on fore-knowledge leading to suitable preventive treatment, followed by consistent baiting throughout periods of apparent freedom from attack. There are a few main facts connected with the life-history and habits of the insect which have a direct bearing on control; once these are accepted the control recommendations are seen to be simple and obvious.

1. The eggs are laid into the banana plant tissue at or about ground level. They are inserted to a depth of about one-twelfth of an inch into a cavity eaten out by the female. Almost immediately afterwards sap exudations seal the egg in the cavity. The egg is thus safe from outside influences unless the outer tissue of the plant is removed.
2. It is the larval stage of the insect that causes the economic damage to the plants. The grub tunnels within the corm without breaking to the outside, and consequently it also is protected from direct control measures.
3. The insect pupates within the food tissue and this resting stage, during which transformation to the adult takes place, is also protected.
4. The adult feeds moderately, but the danger from it lies in the fairly continuous egg-laying during a long life. The beetles are quite active in dark places, and they shun the light; this suggests activity at night. If disturbed they sham death. The favourite sheltering spot in a plantation is in old rotting banana plants and the rotting butts. The adult is the only stage in which external feeding and wandering takes place, and routine treatment in the plantation can be directed only against the adult.

Plant Clean Suckers.

Every new area should start off with clean suckers, and the following points should be observed:—

1. The source of the suckers should be a beetle-free plantation, or one with only a light infestation in which control measures have been consistently carried out. It must be understood that this brief statement does not deal fully with the conditions under which suckers may be obtained, but gives only the broad outline. Growers should make themselves acquainted with the current planting policy as laid down by the Banana Industry Protection Board; particulars may be obtained from the local agent of the Board.

2. The suckers selected should, at the time of digging, be healthy and show no signs of banana weevil borer damage.

3. The whole of the corm of each sucker should be completely peeled to a thickness of about $\frac{1}{8}$ inch. If in the course of this paring a larval tunnel is disclosed, the sucker should be rejected; in a few cases it may be possible to cut away a shallow infestation and leave only clean white tissue without destroying the sucker. The paring will thus ensure that larvæ are not present within the sucker, and at the same time will remove any eggs that may be lying unhatched in the surface tissue. This paring of the sucker and the consequential removal of the roots will not affect subsequent growth.

4. The suckers should be bagged and removed from the plantation before nightfall. Consequently, the suckers cut each day should be limited to the number that can be treated and carted away.

5. If desired the selected suckers may be sent unpared from the parent plantation, provided they are bagged and carted away before nightfall. On arrival at the new area they should be immediately pared as described above at some distance from the actual plantation; the parings and any rejected suckers should be immediately destroyed. Burning, or the spreading of the parings in the sun for quick drying, and chopping the rejected suckers into small pieces and spreading to dry are satisfactory methods, with the preference on the burning.

Bait the Plantation Regularly.

The standard poison for use against the banana weevil borer consists of one part of Paris green mixed dry with six parts by weight of flour. The most convenient quantities are 1 lb. Paris green and 6 lb. flour. These should be placed in alternate layers in a large tin with a tight-fitting lid and then well shaken together. It must be remembered that Paris green is a strong arsenical poison, and it should be stored and handled with care. The only apparatus needed for the application is a castor tin with fine holes. A ½-lb. cocoa tin with fine perforations in the lid makes a satisfactory poison carrier.

A careful watch should be kept in a young plantation, and any suckers which, by slowness of growth or death of the centre leaf, show signs of borer attack should be dug out, and if the suspicions are confirmed should be destroyed by slicing into small pieces for quick drying in the sun. The hole may then be replanted with a clean sucker.

As the plantation grows the stage will be reached when desuckering of unwanted eyes will be necessary. As each sucker eye is cut off or gouged out, the newly-cut tissue should be lightly but evenly dusted with the poison mixture. The butt of the sucker eye may also be cut off, dusted, and loosely replaced in position. The extra work involved in making of each cut surface a poison bait is simply that of carrying a small tin of the poison mixture. The implements for desuckering should always include a tin of 1 in 6 mixture.

The spent plants in mature plantations should be adequately dealt with after the bunch has been removed. The old plant should be cut off at not more than 6 inches from the ground, split up longitudinally, and cut across not less than four times. This ensures that the plant tissue will lie open, dry quickly in the sun, and be quickly rendered unsatisfactory as a breeding site and a shelter for the adult beetles. In the case of beetle-infested plants, it is required by regulation that the butt remaining be converted into a poisoned bait. The method is as follows:—

The plant is cut down, as above described, at not more than 6 inches from the ground, and the butt is again cut at or near ground level. This forms a separate slab a few inches thick, which should be dusted evenly on both surfaces. The upper surface of the butt should then be dusted and the dusted slab loosely replaced, preferably with a small stick or stone between.

Other methods of making poison baits of the old butts have been used, and these have given satisfaction. The two following descriptions may be of interest:—

Method 1.—The plant is cut off as close as possible to the ground and chopped up. With a suckering tool a deep cone is cut out of the centre of the butt. The surfaces of the butt, the cavity, and the cone are evenly dusted, and the cone is then loosely replaced.

Method 2.—This is the same as the preceding method, except that instead of a cone a deep wedge is chopped out of the butt with a cane knife or mattock. After dusting, a tiny stone in the cavity will ensure that the wedge does not fit too tightly when replaced.

Each of the above methods provides a poisoned cavity which will afford shelter to the beetles and remain moist, and therefore attractive for some time. A little trash over each bait will increase the period of attractiveness by delaying the drying out. The thickness of the dust application is rather important. What is required is a thin but even dusting or peppering of the tissue; undusted freshly-cut areas would provide attractive and safe feeding sites for the beetles, while thickly-coated areas would not be sufficiently attractive.

Two reasons for discouragement regarding baiting may influence some growers. The first is that complete eradication of the beetle may be expected by some, and a method which does not give it will be criticised. Complete eradication is an almost unattainable ideal; what can be accomplished is to reduce and keep the beetle population at a level where it will cause little or no economic loss. The second is that growers are often dissatisfied with the proved kill in the form of dead beetles in or near the baits. Remember that some hours will elapse after feeding before the insects die from Paris green poisoning, and in that time they may crawl to fresh shelter, and later they will be disposed of by ants and other scavenging insects.

The methods above described of making each fresh-cut surface into a poisoned bait, whether in suckering or after cutting the fruit, will ensure that at least two fairly fresh baits are present in each stool throughout the year—in other words, approximately 1,000 baits per acre. The cash outlay for materials is a few shillings, while the extra labour involved is negligible.

Queensland Grasses*.

By C. T. WHITE, Government Botanist.

THE known native grasses of the State, compiled from a list made by Mr. C. E. Hubbard, of the Royal Botanic Gardens, Kew, England, who spent about twelve months as a botanist on the staff of the Queensland Department of Agriculture and Stock, number about 450 different kinds or species. To these must no doubt be added another fifty yet to be scientifically catalogued and described, bringing our grass flora to a total of at least 500 species. Is it not natural to assume that among these we have some of outstanding merit and worthy of every attempt to distribute and improve?

Native Pastures.

Before dealing with any grasses specifically, it may be as well to give a brief general account of our native pastures. Excellent cattle pasturage exists along much of the coastal portion of the State. Typical tropical savannah forests, consisting of low eucalypts, wattles, and other trees, with an undergrowth of grasses and herbage, are found over much of the Cape York Peninsula, improving as one comes south to the Gulf country, where a great mixture of grasses and herbage occurs in the pastures, among the better grasses being Blue Grasses, Kangaroo Grasses, Flinders Grasses, Star Grasses, Couch Grasses, Love Grasses, Panic Grasses, and native Paspalums, Setarias, and Sorghums. Southward from Ingham, through Townsville to Proserpine, there is a "dry" belt. The native pastures are mostly coarse in appearance, and in a lot of the open forest country Blady Grasses and Spear Grasses predominate. During the wet season some of the larger grasses, such as the Tall Spear Grass (*Heteropogon triticeus*), the native Sorghums, &c., grow to a great height, eight to ten feet or even more. Some of the best pastures in the open eucalyptus country are composed of Kangaroo Grass in almost a pure stand.

Of recent years anywhere near a settlement *Chloris barbata*, an ally of the Rhodes Grass, and noticeable on account of its purple heads, has become an outstanding grass in the native pastures. It has been highly spoken of, but it is rather doubtful if it has any great value. The common tropical weed, *Stylosanthes mucronata*, the so-called Townsville Lucerne, has spread everywhere, greatly improving the pastures. Cattle are very fond of this leguminous plant, and analysis shows its feeding value to be high. Unfortunately, it is only of annual duration, and dies out on the approach of the dry winter and spring months. Some native legumes enter into the composition of the pasture, notably species of *Alysicarpus*, of which the most important is *Alysicarpus vaginalis*. These are worth every encouragement, and where allowed to seed and reproduce naturally for a season or two, treble or more the carrying capacity of the land. From Proserpine southwards to Koumala the rainfall is high, but the pastures are poor. This is essentially sugar country, however, and stock-raising is of little importance.

Southward to about Gladstone is another "dry" belt. The pastures improve considerably, carrying in many cases a very heavy mixture of species, though they suffer severely from continued dry spells, parti-

* Paper read before the Royal Society of Queensland, 23rd October, 1933.

cularly in the winter and spring months. Among the grasses composing the pasture are different sorts of Blue Grasses, Kangaroo Grasses, Star Grasses, Couch Grass, Love Grasses, Native Millets, Cockatoo Grass, and others.

In some parts of Central Queensland, such as the Dawson Valley, native pastures are those of the coastal type, except that some of the better western grasses, such as the Mitchell Grasses, Flinders Grasses, and some of the better Panic Grasses, intrude.

In the Burnett, Lockyer, and Brisbane Valley areas, the better open eucalyptus country supports native pastures for the most part of a rather high order, consisting of a general mixture of Blue Grasses, Panic Grasses, Kangaroo Grasses, &c. Herbaceous plants, comprising a fair number of legumes, are also a feature of these pastures. Unfortunately, a wide area of this country has suffered badly through overstocking, with the consequence that the better mixtures have been eaten out, leaving, in many cases, almost a pure stand of the Bitter or Pitted Blue Grass (*Amphilophis decipiens*).

An interesting feature has been the alteration in some localities, particularly near the larger towns of the South, of the composition of the native pasture. In most cases this has deteriorated through overstocking, but in many cases the original mixture has given way to pastures almost entirely composed of the Blue Couch (*Digitaria didactyla*), and here and there in smaller areas the common Couch (*Cynodon dactylon*), and this must, I think, be regarded, on the whole, as improving the carrying capacity of the pastures.

A distinct type of pasture in coastal Queensland is the fresh-water swamp pasture of a high grazing value. In this the most important grasses are the Water Couch (*Paspalum distichum*), White Water Couch (*Panicum obseptum*), Rice Grass (*Leersia hexandra*), Native Millet (*Echinochloa crus-galli*), and *Hemarthria compressa*. Along the whole of the coastal belt a distinct type of pasture is the salt-water meadow, which in most cases consists of a pure stand of the Salt Water Couch (*Sporobolus virginicus* var. *minor*). In the more muddy places towards the edge of this pasture the Salt Water Couch may give way to the Salt Water Paspalum (*Paspalum vaginatum*).

Pastures of Western Queensland.

The pastures of Western Queensland are of a sufficiently high standard to be famous throughout Australia. Of the grasses composing the pastures, the best known are the Mitchell Grasses, Flinders Grasses, native Panic Grasses, Blue Grasses, better-class Star Grasses, and Love Grasses, &c. Here and there on the Darling Downs and in the Granite Belt Danthonia Grasses, such as *Danthonia pallida, Danthonia racemosa*, and *Danthonia longifolia*, are of some importance, though not nearly to the same extent as they are in the colder places further to the south, such as the New England Tableland. Annual herbs following the summer rains are a feature of much of the grass land. These belong to a great range of families, the Amaranths, the Saltbushes, the Legumes, and the Mallows being among the most valuable.

Mitchell Grasses.

Now to deal with some of the grasses individually. Undoubtedly the grasses most associated with Australia, both in the country itself Though Mitchell is generally regarded as the discoverer of Mitchell who found *Astrebla pectinata* near Condobolin and on the plains of the Bogan in New South Wales in 1836. These were described at the time by the great English botanist Lindley as *Danthonia pectinata*, and are to be found preserved at the present time at the Museum and Herbarium of the Department of Botany of the University of Cambridge, England. Though Mitchell is generally regarded as the discoverer of Mitchell Grass, specimens had already been collected by both Cunningham and Fraser as early as 1817, though apparently they remained undescribed, and indeed unrecorded at all, until C. E. Hubbard, when monographing the genus, found the specimens at the British Museum of Natural History, London. The Mitchell Grasses are widely spread over the heavy blacksoil plains of Northern Australia, Central Australia, Queensland, and New South Wales, but finding their greatest development in Queensland. The genus is confined to Australia. Four distinct species are to be recognised:—

1. *Astrebla pectinata*, often known as the Common Mitchell, is the commonest form in New South Wales, but is comparatively rare in Queensland. It has a wide distribution through Central Australia to Western Australia, but in the last-mentioned State is, I understand, very rare.

2. *Astrebla lappacea*, known as the Wheat-eared or Curly Mitchell. This is the form most abundant in Queensland. Like the Common Mitchell, it has a wide distribution, but is nowhere so abundant as in Central Queensland. It has a long wheat-eared seed head, and is probably the most important species of the genus from an economic standpoint. In the older literature it is referred to as *Astrebla triticoides*, but this excellent specific name has, unfortunately, to give way on account of priority to *Astrebla lappacea*. This latter name was used by Lindley as far back as 1848, when he named the grass *Danthonia lappacea*, based on specimens collected by Sir Thomas Mitchell, near Mitchell, Queensland, in 1846.

3. *Astrebla squarrosa* is the Bull Mitchell, moderately common in parts of Central and North Queensland, also found in the Northern Territory and the north-west of New South Wales. It is a coarse species not occurring in such great quantities as *Astrebla lappacea*. Its economic value is not quite clear at the present time, though it does not seem to be the equal of the common *Astrebla lappacea* as a stock grass. It yields a very large seed, however, and a correspondingly large grain, and if Mitchell Grass has any importance in the future as a grain crop *Astrebla squarrosa* may prove of considerable importance.

4. *Astrebla elymoides*.—This is variously known as the Hoop Mitchell, Wire Mitchell, and Weeping Mitchell. It is very distinctive looking from all the others, and has a wide distribution through the north-west of Western Australia, Northern and Central Queensland to New South Wales. It is quite a good fodder grass, but suffers in comparison with its better relatives.

Flinders Grasses.

Ranking next in importance to the Mitchell Grasses in the eyes of the pastoralists of Northern and Western Queensland are the Flinders

Grasses, of which at least four distinct kinds have now been recognised. They all belong to the genus Iseilema, which is composed, so far as known, of nine species, five of which are found in tropical Asia and four in Australia. Until recent years all the Australian kinds were looked upon as forms of one species. During the summer months of 1909-1910 the Czecho-Slovakian botanist, Dr. Karel Domin, botanised extensively in Queensland, and he paid special attention to the grasses, making extensive collections. He recognised four distinct species among the grasses known collectively as Flinders Grass. Of these I think the most abundant, and fortunately the best of the genus, is *Iseilema actinostachys*. The value of Flinders Grasses lies in their peculiar habit of growing very quickly during the rainy season, soon dying off, but being extremely palatable and nutritious in the form of standing hay, in this respect surely differing from all other known grasses. The nutritive value is due to the amount of grain produced and the peculiar way in which it is borne among small leaves over almost the whole plant. The Flinders Grasses are extremely brittle when dry, but all stock greedily lick up the broken pieces and do well on them. As a hay crop for dry tropical and subtropical regions with a short summer rainfall season, the Flinders Grasses are probably unequalled, making up in high nutritive value what they lack in bulk.

Blue Grass.

Extremely important on the Downs country of Queensland and New South Wales, and particularly in this State, is the Blue Grass, *Dichanthium sericeum*, in its typical form distinguishable in the field by its bluish-green colour, luxuriant appearance, and soft silky seed heads. A number of forms are distinguishable, and they are at present under review by Mr. C. E. Hubbard, whose classification of them is looked forward to by botanists and agrostologists. One may say, "Why worry about the finer points of the classification of these grasses at all? Where does it lead?" But surely it is hardly necessary to point out that a good sound botanical classification is the basis on which all future work on the improvement of the grasses by selection and hybridisation rests. Blue Grass has an exceptionally high reputation as a fodder among pastoralists. It is usually one of the earliest grasses to shoot in response to spring and early summer rains, but is not particularly drought resistant. It makes one of the best grass hays possible, and as it produces an abundance of seed it is worthy of study from the agrostologist and plant breeder. E. Breakwell, in his excellent book on "The Grasses and Fodder Plants of New South Wales," states that it has been found that the smallest and plumpest spikes produce the best seed.

Panic Grasses.

Forming a very large percentage of the bulk of the average native mixed pasture are the various sorts of Panic Grasses. These were all included in the earlier works on Australian grasses under the genus Panicum. This genus has now, however, been divided into numerous smaller genera, the genus Panicum itself, in a restricted sense, being comparatively small, and including, for the most part, grasses with widespreading, much branched, seed heads, such as *Panicum decompositum*, often referred to as Native Millet, *Panicum trachyrachis*, Coolibah Grass, *Panicum prolutum*, Coolah Grass, and a number of

others, common enough in the pasture but lacking distinctive local names. As at present understood, twenty different kinds of Panicums, or Panic Grasses proper, are found in Queensland.

Paspalidium Grasses.

Of the grasses split from the Panicums are those forming a group now known as the Paspalidium Grasses. Paspalidium is a small genus of about sixteen species, of which ten are found in Australia, all the Australian species being found in Queensland, though most, of course, extend to New South Wales and the Northern Territory. They are remarkable for the great amount of grain they carry in narrow, spike-like seed heads. Most of them are extremely palatable. The largest is *Paspalidium globoideum*, known as Shot Grass or Sago Grass in Queensland. It grows 3 feet to 4 feet high or more, is extremely palatable to stock, and bears a sago- or tapioca-like grain. This grain is borne in great abundance, and is one of the staple foods of the grain-eating birds in the west; in fact, one pastoralist, Mr. J. Garvey, of Fernlees, Central Queensland, in sending specimens of this grass along with other Paspalidiums, stated that the Budgeeragahs fed so heavily on the seed that the grass did not get a chance to establish itself properly. Among the smaller growing Paspalidiums are several known as Brigalow Grasses or Wallaby Grasses. Prominence has recently been given to one of these in a paper before the Royal Society of Queensland by Dr. E. Hirschfeld, and following this a good deal of interest has been focused on this particular grass. Since the reading of Dr. Hirschfeld's paper I have had several specimens from different pastoralists, along with some valuable notes. Particularly am I indebted to Mr. J. Garvey, of Sandhurst Park, Fernlees. A series of specimens from him with notes attached is exhibited herewith.

Paspalidium flavidium is a large species intermediate between the smaller Brigalow Grasses and the Shot Grass or Sago Grass, *Paspalidium globoideum*. Of the Brigalow Grasses proper we can now, I think, recognise at least three distinct species, namely: *Paspalidium gracile*, *Paspalidium distans*, and *Paspalidium caespitosum*. At the present stage of our knowledge I do not care to state which is the best. Probably the values are more or less similar; but, in any case, they represent a very fertile field for intensive work by agrostologists in the future.

Many other grasses go to make up the mixed native pasture—Love Grasses, Kangaroo Grasses, Oat Grasses, Star Grasses, &c.—but time does not allow to deal with these in any detail. However, farmers, pastoralists, and others are invited once more to forward specimens of grasses and herbage to the Department for identification and report.

Agricultural Notes.

By H. S. HUNTER, Agricultural Branch.

Seasonal Prospects.

THE year 1934 has been ushered in in the midst of a bounteous season as a result of well-distributed and profitable rainfall, which, commencing in the winter months, continued at regular intervals of short duration throughout the spring and early summer.

Although some districts may have experienced a lack of moisture at some time during the spring months, and others a surfeit of wet weather, the season generally is regarded as the best within the memory of persons who gain their livelihood from the products of the soil.

A pleasing feature of the improved conditions is that good soaking rainfall has extended to the inland pastoral areas, some parts of which have been in the grip of drought for a number of years. In the Central-West, there is an encouraging revival in pastoral activity, following on the resuscitation of pastures, the replenishing of water supplies, and the rise in wool values.

In the agricultural areas, the principal industries largely have been in a state of over-production, with, as a consequence, low market values for market products; but, nevertheless, a land hunger is in evidence, as witness 1,143 applications for three blocks of land opened for selection recently in the Chinchilla district.

Sugar.

Along the tropical coast a bumper sugar crop is expected owing to phenomenal winter rains, and it is anticipated the total yield will break all previous records. Many mills will exceed their peak as allotted under the "peak year scheme." The heavy production this year has brought up the question of restricting individual acreages, and the matter will be considered at a conference to be held within the course of a few weeks. The advance payment for sugar produced in excess of the peak is being made on the basis of £5 12s. per ton.

Wheat.

Most of the wheat crops have been affected to some degree by continuous wet weather immediately prior to and during harvesting, which resulted in the lodging of the crops and the bleaching of the grain. In some districts, where harvesting operations were not unduly delayed, little damage was sustained by standing crops, but where bagged wheat was caught lying in the field, the grain suffered.

Unfortunately, earlier expectations of a record yield of high-quality grain will not now be realised, but, nevertheless some satisfactory returns have been obtained. For example, numerous crops of from 30 to 45 bushels per acre have been reported. Pittsworth probably will be hard to beat for the district average. On Mr. J. E. Bligh's "Anchorfield" property, at Brookstead, a 10-acre seed propagation plot, planted in co-operation with the Department of Agriculture, with the new "Seafoam" variety recently released from Roma State Farm, gave an average return of 49·8 bushels per acre. At Felton, the encouraging

return of 512 bags from 32 acres, or 48 bushels per acre, was obtained with the Pusa variety by Mr. M. Cooper. An adjoining paddock of Clarendon, carried an equally heavy crop, but owing to heavy infestation with convolvulus, it was possible to recover only an average yield of 36 bushels. Mr. F. Benn, of Apunyal, secured an average yield of 45½ bushels of good quality wheat from a 6-acre area.

The Maranoa has experienced the best wheat season for many years and, although rains came at an inopportune time, the harvesting was not interfered with to the same extent as on the Darling Downs. A yield of fairly good quality grain is expected, which in quantity will overtax the existing storage facilities. One encouraging feature of the late rains in that district is that the soil is well stored with moisture, some of which, by immediate ploughing and thereafter periodical cultivation, can be retained until next planting season—a factor of importance to the wheat industry of the Maranoa.

Cotton.

An exceptionally heavy rainfall over the main cotton belt has made it difficult for cotton-growers to get on to their land and to keep weed growth in check, but, nevertheless, the season has been unusually favourable to the growing crops. It is estimated that approximately 85,000 acres have been planted, and experiences to date indicate a record harvest.

Peanuts.

A record crop also is in prospect with peanuts. Some 8,000 acres have been planted, and the Peanut Board is experiencing difficulty in meeting all orders for seed. The increase in area is due largely to the fact that for the first time in the history of the pool there is no carry-over from the previous season, and farmers had been enjoined to plant larger areas to meet Australia's peanut requirements. It is to be regretted that the Commonwealth Government since has lifted the embargo on the importation of Chinese peanuts, and as a consequence the crop will have to be marketed without that assistance.

Tobacco.

The usual difficulty is being experienced in raising seedlings owing to the ravages of disease, principally blue mould, and in many instances new seed-beds are being sown.

Considerable success has attended the use of sprays recommended by the Department, but in many instances the spray has been washed off the plants by the frequent rains. The period for transplanting to the field now is near at hand, and until this operation takes place, it will be difficult to forecast the area which will be planted with the crop this season. In the Texas and Inglewood districts where transplanting takes place earlier than nearer to the coast, it is apparent the area will be considerably below that of last year. In other parts reduced areas are possible, owing to numerous causes, including lack of finance, disease, and unsuitable soil. Early forecasts indicate increased areas in the neighbourhood of Mackay and Miriam Vale.

Large quantities of unsold leaf of the darker grades are proving embarrassing to the growers, especially where the proceeds from the last crop have not been sufficient to meet commitments.

Maize and Dairy Fodders.

The mid-season and late-planted maize crops are in excellent condition and, given a continuance of the favourable season, exceptionally good yields should result. Heavy yields of dairy fodders are assured; in many instances these are being harvested and converted into hay or silage.

The latter method is proving popular, as weather conditions have not favoured haymaking. For this reason lucerne is being ensiled to some extent. Although not suitable for this purpose when used alone, it makes excellent silage when mixed with maize or some other bulky fodder.

Fruit Crops.

The continuous rains have threatened the success of the early fruits from the Granite Belt by adversely affecting their flavour, but later fruits are doing well. Citrus and tropical fruits have excellent prospects of producing heavy yields. The citrus crop, which may be a record for the State, is expected to mature earlier than usual, and thus will be enabled to reach the local and Southern markets before the Southern-grown citrus fruits are available. The grant from the Fruit Industry Sugar Concession Committee to assist the pineapple-canning industry has been renewed for another year.

PLATE 16.—LIVE PORK FOR CHRISTMAS AT A NEW GUINEA HEAD HUNTERS' CAMP.

These Mohamato natives had previously been shooting arrows at passing survey men, so brought in a pig as a peace offering. They always roast their pigs alive, and the jungle is made hideous with the dying animal's cries.

PLATE 17.
Gatton Queen and her litter in the Large White section of the Piggery, Queensland Agricultural College, Gatton.

PLATE 18.
Piggeries at the Willowburn Hospital, Toowoomba, showing layout of yards.

PLATE 19.
A shady corner of the Pig Run at Willowburn Hospital, Toowoomba.

PLATE 20.
Gatton Dell and her litter in the Berkshire section of the Piggery, Queensland Agricultural College, Gatton.

The Premier's New Year Message.

PROGRESS TOWARDS PROSPERITY

THE year 1934 is being ushered in under more happy auspices than have obtained since the economic disturbance first began to manifest itself. Most parts of the State have shared recently in Nature's bounteous rains, which not only give encouragement to our citizens generally, but ensure the maintenance of the volume of production in our primary industries.

The rise in our wool prices, particularly, will mean a welcome increment in the national income of the State, the effect of which may be gauged from a comparison of the value of our exports overseas for the first five months of the current financial year up to the end of November last with the corresponding period of the previous year. The published statistics show that for the months of July-November of the current year, exports overseas from the State were valued at £2,400,000 more than for the same months of 1932-33.

A pleasing feature of recently published figures is the fact that the volume of employment continues to show progressive increases, and during the coming year it will be the Government's aim to implement this improvement in every possible way. The programme of works and development that will be undertaken in 1934 will not only provide further avenues of normal employment, but will be of much value in assisting commercial activity generally.

I earnestly hope that the coming year will bring with it an improved price level that will offer stability to all our citizens engaged in various kinds of industry. Events of recent years since the economic crisis asserted itself indicate the necessity for vital adjustments in order that undeserved poverty and the evils of unemployment might be banished from civilisation.

It can be accepted as an axiom that man's inventive genius and the application of scientific methods have been successfully applied in the realm of producing commodities that are essential for the welfare of the human race. The same energy, zeal, and activity are required in the solution of the concomitant problems of distribution and consumption.

I wish our citizens a Happy New Year, and sincerely trust that the State generally will continue its progress towards restored prosperity.

W. Forgan Smith

THE DAIRY INDUSTRY.

SUPPLIED BY THE DAIRY BRANCH.

NOTES ON STARTERS (LACTIC CULTURE).

Flavour and Aroma.

Scientific research has revealed that during the normal ripening period the development of flavour and aroma in starters is not proportional to the acid production, but a definite acidity such as 0.65 per cent. to 0.75 per cent. is necessary before the desired flavour and aroma become pronounced.

With continual growth of the organisms over-ripening results, giving off flavours and aromas that are sometimes very objectionable. Considerable acid development is necessary in a starter, but overacidity is undesirable. The exact range of acidity over which flavours and aromas are satisfactory probably varies with different cultures.

Acidity.

The composition of milk has an important influence on the acidity development in starters. It has been shown that there is a general tendency for a higher acidity to be developed by a starter in milk with a high total solids than in milk with a low total solids.

The amount of acidity developed by a starter is apparently a more or less definite thing and cannot be changed appreciably by varying the amount of inoculating material used in the production.

Over-ripening of Starters.

The term over-ripe in connection with starters refers to the holding of a firmly coagulated starter under conditions favourable for the growth of the contained organisms. The result of such continued holding is the development of an excessive acidity, and a more or less objectionable flavour and aroma. Excessive acidity is due to the failure of the acid, which caused the coagulation, to restrain the growth of the acid producting organisms, while over-ripe flavour and aroma are presumably due to the products formed by the bacteria either directly or through the action of such materials as acids and enzymes elaborated by them.

Effect of Temperature of Pasteurisation of the Starter Milk on the Rate of Coagulation of a Starter.

Results have shown that milk heated to 145 deg. Fahr. for thirty minutes developed acid, and coagulated more slowly than milk heated to a considerably higher temperature.

Essentially the same rate of growth of starter organisms occurred after heating to 160 deg. Fahr. for thirty minutes, as when a higher temperature was used for this period. Heating to a temperature of 180 deg. Fahr. for at least thirty minutes is the practice that is usually desired in the production of a high grade starter. Somewhat lower temperatures might be used without any noticeable change in results, but a much lower temperature should be avoided. This temperature brings about a fairly rapid coagulation of the starter, and investigators have found that rapidly coagulated starters were better than those which coagulated slowly. This advantage may be due to the greater tendency of rapid acid development to restrain undesirable organisms.

Quantity of Starter for Inoculation Purposes.

The rate of coagulation of the starter is not greatly affected by the amount of starter added for inoculation purposes; that is, a light inoculation of the milk for the production of a starter sometimes coagulates quicker than a heavy inoculation, while at other times the reverse occurs.

MILK FOR CHEESE MAKING.

For cheese making, the milk supply should be graded, and the grading checked by the use of the methylene blue test and the Wisconsin curd test in conjunction. In this way, exact information as to the quality of the milk of each supplier at every delivery is obtained. It also stimulates the interest of suppliers in the manufacturing processes.

Suppliers should always be informed of the results of factory tests, for improvement in the quality of milk is primarily an educational matter. The sources, development, and control of bacteria in milk should be discussed with them. While daily deliveries of high grade milk are usual, it must be remembered that from time to time milk of a lower quality is delivered from the same farms. The bacterial count in the poorer milk is often so high as to effect seriously the whole of the day's supplies

to the factory with which it is mixed. The fact that most of the milk delivered is high grade shows that there is no reason why every gallon sent in should not be of the same quality.

It is obviously quite unfair to penalise one's more efficient neighbour by supplying milk of a lower quality, which on being mixed with the whole supply must bring the general average of quality down. In the language of the bush it is nothing more or less than "polling on your mate," a social sin which even the best of us finds it hard to tolerate.

What one farmer can do in the same locality and under the same conditions, the other farmer can do, so there should be no excuse really for sending second rate milk to the cheese factory. If, however, in spite of whatever care is taken to keep supplies up to the required standard, no improvement is apparent, the suppliers concerned should be encouraged to discuss their individual problems and methods of milk production and handling, and so help to clear up any difficulties or doubts they may have. If any improvement in the supply results from investigation or advice, the farmer concerned ought to be told about it strightaway. If on the other hand, low quality persists in a particular supply, the producer should be made aware of the facts, in a frank and friendly way, so that they may be grasped readily and appreciated.

Mere fault-finding is useless as well as exasperating. If an investigation is necessary, let it be a friendly investigation. The work, after all, is educational; it becomes a check on supplies and factory processes through which the faults, whether on the farm or in the factory, may be corrected.

To maintain an efficient check on the quality of supplies, all milk should be sampled immediately on delivery each day. To sample milk one day and neglect it the next is anything but satisfactory, for variable conditions make it impossible to interpret the results correctly. Climatic changes, for instance, influence directly bacterial counts.

When all is said and done, the thing that matters most is the financial return. Show the supplier that a high grade product puts more money into his pocket, and he will work overtime in finding and remedying the faults that reduce his income.

MINERAL DEFICIENCY IN DAIRY STOCK.

MEDICAL men, research workers, and other interested people have during the past ten to twenty years realised that many abnormal and diseased conditions are connected with or due to deficiencies in the food supplied to stock, and that some of these diseases may be traced to the absence of the proper quantity of mineral substances in the soils in which the grass and crops are grown.

Considerable research on the subject by Sir Arnold Theiler, South Africa, Orr, of the Royal Institute at Reading, England, Eccles in America, and Henry and Brünnich in Australia, has demonstrated definitely that soil and pasture are the keys to normal health in stock.

Mineral deficiency in soil and pastures is of particular interest to stockowners in this State, for upwards of 70 per cent. of the products of the State are derived from our native pastures.

One of the most demonstrable deficiency diseases in humans is to be found in the case of those associated with iodine deficiency. This is often reflected in the enlargement of the thyroid glands producing what is known as goitre. The thyroid glands are situated on either side of the windpipe and these store and distribute the supply of iodine to the body. This deficiency in iodine supply not only produces goitre but affects also the functioning of other glands, resulting in abnormalities in growth both physical and mental. In countries such as Switzerland, where the drinking water supply is obtained from melted snow, the result of iodine deficiency is most marked. In Switzerland, for instance, there are said to be over 50,000 imbecile dwarfs. It has been found, however, that where iodised salt is fed, the condition can be prevented and normal development in body and mind continued. In such countries it is usual also to sell iodised sweets, as lollies provide a good medium through which to supply the iodine to children.

Stock are affected very considerably through such a deficiency, which is, of course, more marked in certain parts of the world. In British Columbia (America), for instance, where there is a marked deficiency in iodine, investigations revealed that it was the cause of heavy mortality in calves and pigs through abnormal births.

Recent investigations, however, indicate that it is doubtful whether there is any marked iodine deficiency in Australia. But iodine deficiency is only one direction from which trouble may arise. In different portions of the State we

find cows often passing away an idle hour chewing bones or rags, licking clay deposits, or even finding solace in a stone. This is an instinctive endeavour on the part of the cow to supply herself with some mineral that is deficient in her food, and phosphorus and calcium are the two most common elements that are lacking.

Lime is an important factor in controlling the clotting of the blood, regulating the heart's action, determining the firmness of muscle, assisting the digestion of fat, and in controlling the action of other minerals on the body. Phosphorus is essential for the building up of all tissues of the body, and without it the supply of milk and flesh would be impossible. These two minerals enter very largely into the composition of bones, and, consequently, young animals developing their skeletons or cows in calf require comparatively greater amounts of these minerals.

Mineral Content of Milk.

It must also be remembered, apart from body requirements, there are seven pounds of mineral matter in 1,000 lb. of milk, and as a heavy-producing animal yields her own weight in milk each month, it is essential that she be supplied with an adequate mineral ration to remain in normal health and maintain production to her capacity.

Mineral-Deficient Soils.

The area of mineral-deficient lands within the State is not definitely known, but it is known that the greater part of the coastal area falls within this category. Comprised in this area, however, are portions of normal mineral content, such as where basaltic outcrops occur, and on the alluvial soils of river flats.

It is in these deficient areas where osteophagia (bone-chewing) and osteo-malacia (bone disease) occur. This abnormal condition in cattle has been noticed in inland country. In the Charters Towers area, investigations are at present being carried out by the Council for Scientific and Industrial Research in regard to a deficiency disease referred to locally as "pegleg."

In South Africa, where phosphorus deficiency is a general characteristic of the soils, investigatory work was carried out some years ago into diseases known by the Dutch names of "Stijfziekte" (Stiff-sickness) and "Lamziekte" (Lame-sickness), which were the cause of heavy losses in stock through abnormal growth and mortality. It was at that time determined that these diseases were the indirect consequence of phosphorus deficiency.

It is impossible for any animal on a diet poor in essential minerals to make normal growth or be capable of normal production. The deficiency is thus the cause of ill-health, which may vary in degree from a hardly noticeable lack of the bloom which is characteristic of an animal in proper health to a state like rickets, where it can be obviously diagnosed a disease. Generally it is evidenced in unthriftiness, bone abnormalities, lameness, broken bones, depraved appetite, decreased milk yields and breeding difficulties.

Unfortunately, it is only when the trouble is more or less in an acute form that it is noticeable to the untrained eye, with the result that there are thousands of cattle suffering from malnutrition due to mineral deficiency quite unknown to their owners. The direct economic loss to dairy farmers so situated must be enormous.

If mineral deficiency is suspected on a farm—and this will apply to most of our coastal farms—measures should be taken immediately to remedy it. Obviously the natural method is to ensure that the pastures are not deficient, but as this entails top-dressing the method is too costly to be essentially practicable. It is preferable to supplement the food supply by substances containing the necessary minerals.

A Mineral Mixture for Stock.

In this State it is recommended that a mixture of two parts of finely ground sterilised bonemeal, one part of common salt, and a small amount of potassium iodide, 1 or 2 oz. to 1 cwt. of lick mixture, be supplied to dairy cattle. This mixture supplies lime, phosphorus, and iodine, while the salt has a beneficial action on the digestive system. Nauru or Ocean Island phosphate may be substituted for sterilised bonemeal if the latter is not procurable. This lick mixture may be fed at the rate of 2 oz. to 4 oz. per day, but it is preferable to place the lick in a suitable position and allow the animals to partake of it as required. Hand-fed cows in profit can be allowed 2 oz. per day in 1 lb. bran during milking in the shed. The ration could be placed in a small box at the head of the bail to be licked up by the cow.

Much research work remains to be done in respect to deficiency diseases; in fact, it may be said that only the fringe of the subject has been touched. The coming years will undoubtedly see great progress made in this work, both in the veterinary and medical fields.

THE QUEENSLAND PIG INDUSTRY ACT OF 1933.

THIS Act aims at effecting immediate and very definite improvement in the systems under which pigs are bred, fed, managed, and marketed. It aims primarily at the production of healthy, well-developed stock for the local, interstate, and overseas trade, under conditions conducive to greater efficiency and enhanced returns to the producer.

Incidence of Disease.

The pig population of Queensland is approximately 250,000 or one-fifth of the total number in the Commonwealth. A very conservative estimate of present mortality in young pigs—i.e., pigs under 6 months of age—would state the figure at 25 per cent., or a loss each year due to specific and nutritional diseases of some 62,500 young pigs, which might readily be stated as carrying a nominal value of £1 per head. Condemnation of pig carcasses on slaughter for tuberculosis and other preventable diseases total approximately 1.14 per cent. Thus, 4,500 pigs are condemned annually which would carry a market value of 50s. per head, or a total sale value of £10,000. Condemnation of pig heads affected with tuberculosis, abscesses, &c., total 4.38 per cent., while the losses from bruising and damage, improper castration, and from other causes are very heavy.

Industry Losses.

In round figures, therefore, it might be said that the losses from preventable diseases in the pig industry total very close to £100,000 per annum—a condition of affairs which calls for very urgent and definite action on the part of the Government, hence the legislation aiming at reduction in the incidence of disease, and greater efficiency in the industry.

General Improvement in Sanitation and Hygiene.

The Act provides for a general improvement in the conditions under which pigs must be kept on farms. It prescribes in sections 5, 6, 7, 8, and 9 that piggeries shall be kept in a clean and wholesome condition and subject to the control of departmental inspectors. As is well known, there is a tendency on many farms to treat the pigs as scavengers and to permit them to be kept under insanitary conditions—conditions favourable to the development of disease.

It is the desire of those responsible for framing the Act to very definitely assist producers who are sufficiently well informed to understand and practice sanitation, and to keep their pigs under healthy conditions. Similarly, it is intended to extend the instructional campaign so that there will be no necessity to penalise farmers, except in cases of refusal to observe the ordinary rules of health and to co-operate with the Department in a clean-up campaign.

Section 5, in addition to providing for immediate improvement in the conditions under which pigs are kept and fed, definitely provides the inspector with much needed powers to have improvements effected, a power which, in the past, in the absence of disease, inspectors have not possessed.

Provision for notification of disease is essential, especially in cases of infectious and contagious diseases which, in themselves, are responsible each year for a great deal of loss. It is not claimed that Acts like the Diseases in Stock Acts are defective, but rather that with the extension of pig-raising activities it becomes essential to concentrate and to have included under one Act the numerous clauses referring to pigs that are now scattered through several Acts.

Marketing—Sales, Grading, &c.

The basis of the clauses in marketing sections, 10, 11, 12, 13, 14, 15, have been subjects of discussion at numerous meetings of committees of the Queensland Pig Industry Council, and have also been under notice of the Queensland Meat Industry Board and of pork exporters and embody the general desire of trade interests. To encourage the farmer to improve his stock and his piggeries he needs to be paid more on a quality than on a weight basis for the pigs he markets, hence the inclusion of a section to provide for grading of pigs and of carcasses by officers who have the certificate of efficiency conferred on those who qualify by examination as pork and bacon graders.

Section 10 requires that, where pigs are purchased over the scale by a representative of any factory, such representative shall place on such pigs a sufficient mark to ensure identification of the vendor in order that it will be possible more readily to trace disease to the source of origin. Some difficulty arises by reason of the different conditions under which pigs are purchased by proprietary and co-operative factories, but it is believed that the clauses 11 and 12 will give ample scope for the protection of farmers and of business firms, for the farmer is not the only one that suffers as a result of disease and mortality in his herd, or heavy losses for condemnations.

Provision has, however, been made for the net proceeds from the sale of any by-products obtained from a pig, the whole or part of the carcass of which has been condemned, to be paid to the vendor.

Provision has been made for examination of the quality of carcass pork, or bacon sides or parts thereof, and if necessary for a stamp indicating the quality on such goods. This is a clause designed entirely in the interests of producers and consumers.

Regulations.

Regulations under this Act are now being drawn up and it is expected that the Act will be in operation early this year.

QUEENSLAND SHOW DATES, 1934.

Stanthorpe: 7th and 9th February.
Killarney: 16th and 17th February.
Allora: 7th and 8th March.
Clifton: 14th and 15th March.
Tara: 21st March.
Milmerran: 20th March.
Goombungee: 28th March.
Pittsworth: 4th and 5th April.
Warwick: 10th and 12th April.
Toowoomba: 16th and 19th April.
Rosewood Camp Draft: 7th April.
Oakey: 28th April.
Taroom Camp Draft: 30th April.
Taroom: 1st and 2nd May (Rodeo, 5th May).
Dalby: 2nd and 3rd May.
Beaudesert: 2nd and 3rd May.
Charleville: 8th and 10th May.
Nanango: 3rd and 4th May.
Blackall: 7th and 9th May.
Chinchilla: 8th and 9th May.
Crow's Nest: 9th and 10th May.
Boonah: 9th and 10th May.
Monto: 9th and 10th May.
Kingaroy: 10th and 11th May.
Ipswich: 15th to 18th May.
Mitchell: 16th and 17th May.
Wondai: 17th and 18th May.
Roma: 22nd to 24th May.
Gympie: 23rd and 24th May.
Kalbar: 26th May.
Goomeri: 29th and 30th May.
Wallumbilla: 30th and 31st May.
Maryborough: 1st, 2nd, and 4th June.
Childers: 5th and 6th June.
Marburg: 1st and 2nd June.
Bundaberg: 7th to 9th June.
Lowood: 8th and 9th June.
Rockhampton: 19th to 23rd June.
Mackay: 26th to 28th June.
Laidley: 27th and 28th June.
Townsville Rodeo: 30th June.
Bowen: 4th and 5th July.
Gatton: 4th and 5th July.
Kilcoy: 5th and 6th July.
Townsville: 10th to 12th July.
Woodford: 12th and 13th July.
Rosewood: 13th and 14th July.
Cleveland: 13th and 14th July.
Cairns: 17th to 19th July.
Charters Towers: 18th and 19th July.
Caboolture: 20th July.
Nambour: 18th and 19th July.
Pine Rivers: 27th and 28th July.
Royal National: 6th to 11th August.
Imbil: 7th and 8th September.
Beenleigh: 20th and 21st September.
Malanda: 26th and 27th September.
Kenilworth: 29th September.

HOW TO MAKE A ROPE PIG-NET.

E. J. SHELTON, H.D.A., Instructor in Pig Raising.

IN the transport of pigs to rail, sale, show, or market, per wagon, truck, cart, or other open conveyance, some form of net or cover is required to prevent the pigs escaping and to protect them from injury or mishap. The rope pig-net illustrated and described in this article is the type usually recommended for the purpose, for it has the advantage of being simple in structure, easily contrived by the handy man, and is inexpensive, withal durable and convenient.

It is worthy of mention, however, that it is not a sunshade and will not protect the pigs from the blistering effects of the sun when they are exposed to its direct rays as they frequently are when removed from cool protected sties and placed in the cart or wagon for transport by road to the township or trucking station. This suggests the necessity of providing some form of shade or protection, even if it is only a few green bushes or a wet bag or two.

It is important that bacon pigs en route to the factories, and store or pork pigs en route to sales, &c., should be thus protected in order that they will arrive at destination in good order and condition, and, in the case of the bacon factory, free from sunburn or sunscald or other ill-effect.

The method of procedure in the making of a pig-net such as is illustrated herewith is extremely simple, and should be readily understood by all concerned. The materials required are rope and a length of softwood or hardwood board rounded at the edges and 12 to 18 inches long and of the same width at both ends. This piece of board is referred to by net-makers as the mesh stick, its principal use being to keep all the meshes the same size. In actual use a mesh stick 2 inches wide will make a 4-inch mesh; a 3-inch stick a 6-inch mesh, &c. The objective is to have the stick half the width of the mesh it is intended the net shall carry.

In measuring the meshes it is necessary to draw them out to a diamond shape. The 4-inch mesh is preferable for bacon or pork pigs, a smaller mesh for suckers and weaners. Where fishermen set out to fashion a fishing net they use a long needle and the cord is held on a reel or short length of timber, but in the case of a pig-net the rope had better first be rolled up in the same way as the ordinary rope clothesline or sash cord is when purchased; it will then be a simple matter to pass the hank of rope through the loops when making the knots at the corner of each mesh, for the knotting is rapidly performed by an experienced worker.

The Method.

In setting out to make the net, first tie a loop in one end of the rope as in A, Figure 1. Place this knot on a strong spike or hook attached to a post or wall or some other convenient place as at A in Figure 2. Now place the mesh stick under the loop as at B, put the rope around the mesh stick, then pass the rope through the loop and pull rope tight, proceeding to place the thumb of the left hand on the rope beyond the loop as at A in Figure 3, and with a turn of the wrist of the right hand throw the rope to the position shown at B. Next pass the rope behind the loop C, and then through the bight of B and down as at D; draw knot tight, which should now assume the shape indicated in Figure 4. This figure shows the knot made loosely to enable the method of making it to be clearly seen and readily understood. The rope must be held firmly with the thumb at A, Figure 3, when pulling up the knot, as on this depends the uniformity of the shape and size of mesh.

To continue the netting, the stick is withdrawn and placed under A, Figure 4. The rope is then passed around the stick as in Figure 2 and brought through the loop A, Figure 4, and the process shown in Figure 3 is repeated to form another mesh, this being continued to make a chain of meshes, say, the width of the conveyance to be used when transporting the pigs to rail or sale. The loop A, Figures 1, 2, and 5, first tied is then untied and it will be found that all the meshes are equal in size. Next the chain of meshes is opened out at right angles to the line in which it was made, as shown in Figure 6; in other words, remove the chain of meshes from a vertical position as in Figure 5 and place them in a horizontal position as in Figure 6. A line is run through the meshes D, E, F, G, and secured between two posts to hold the net while continuing the meshing. Working across is then begun by making a mesh at A, Figure 6, then at B, C, and so on until the length of the first lot of meshes has been reached, when the right hand side of the net is turned around and placed where the left hand side was and the left hand side placed where the right-hand side was. Another row of meshes is started on the left-hand side (facing the net) and worked until the one under A has been reached on the right-hand side.

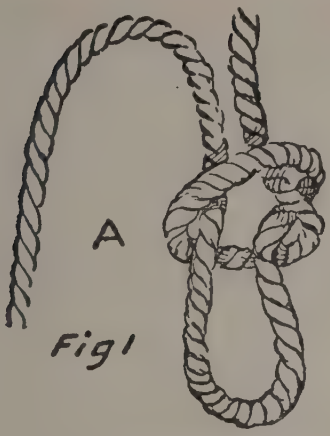

Fig 1

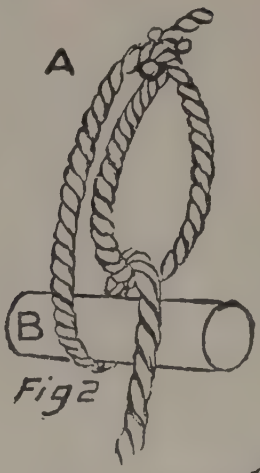

Fig 2

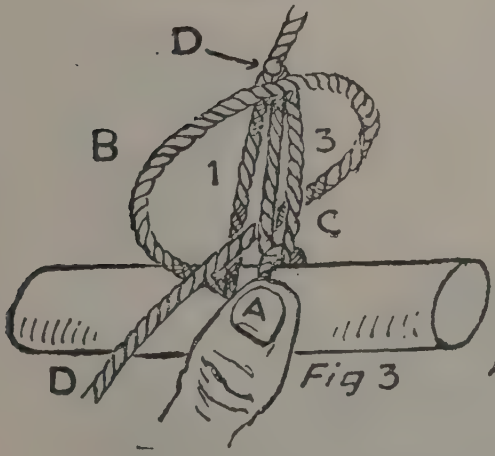

Fig 3

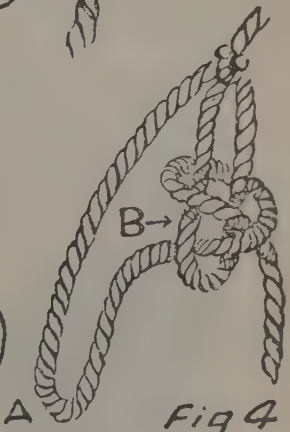

Fig 4

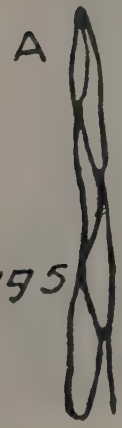

Fig 5

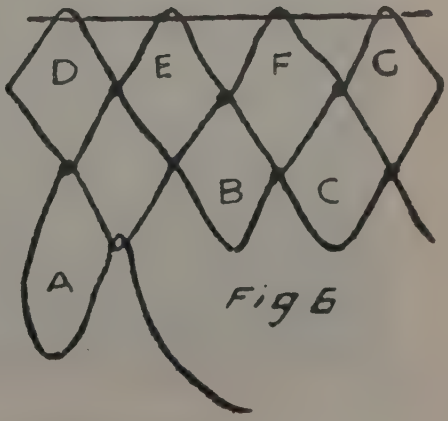

Fig 6

PLATE 21.

The net is turned again, and another row of meshes commenced on the left-hand side, and so on until there are enough rows of meshes to cover the vehicle. To secure the net to the vehicle use rope plough lines, and reeve them through each mesh and around the side and end rails of the body of cart. The method described herein of making the meshes is the same as is used in making ordinary hammocks.

Rope pig nets may be purchased at most country stores, or if not on hand could readily be ordered, but it is neither an expensive or difficult task working one up, and from the instructions given above and illustrated any handy person should be able to complete the job. If wet bags are being used as a cover when the pigs are loaded, tie the bags to the net at each corner of bag; this will save inconvenience and loss, and will be more satisfactory.

It is preferable that the net and bags should be at least twelve inches above the backs of the pigs, otherwise the net is inclined to rub and injure the flesh and blister the skin. Every possible care and attention should be given to see that this does not happen, hence it is desirable that the net be made six or more inches wider than the vehicle on which it is to be used.

In loading secure the net on both sides and in front, first leaving a good length of plough rein free to tie the net to rail of tailboard when pigs are loaded and vehicle is free from loading race.

PLATE 22.

A deep, rock-walled ravine in the Carnarvon Range, a "newly-discovered" scenic region in Queensland's Middle West remarkable for its wild beauty, and abounding in native game.

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Book of the Australian Illawarra Shorthorn Society, the Jersey Cattle Society, and the Friesian Cattle Club, production charts for which were compiled for the month of November, 1933 (273 days period unless otherwise stated): —

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORNS.				
MATURE COWS (OVER 5 YEARS), STANDARD 350 LB.				
Gentle 2nd of Blacklands (365 days)	H. D. Giles, Biggenden	11,210	504·095	Sir Hugh of Hillview
Primrose of Trevor Hill	G. Gwynne, Umbiram	11,045·6	448·973	Prince of Braemar
Carnation of Trevor Hill	A. E. Vohland	10,492·8	429·362	Prince of Braemar
Betty of Lyndith	S. H. Teese, Veresdale	11,731·06	423·001	Karl of Ashbourne
Bluebell 3rd of Happy Valley	R. R. Radel, Coalstoun Lakes	8,266·95	370·914	Chief of Hillview
JUNIOR, 4 YEARS OLD (UNDER 4½ YEARS), STANDARD 310 LB.				
Velvet of Trevor Hill	G. Gwynne, Umbiram	8,585·1	369·427	Prince of Braemar
Voco of Wilga Vale	C. O'Sullivan, Ascot, Greenmount	8,968·15	349·535	Reliance of Blacklands
Violet of Trevor Hill (269 days)	G. Gwynne, Umbiram	9,191·2	347·288	Prince of Braemar
SENIOR, 3 YEARS OLD (OVER 3½ YEARS), STANDARD 290 LB.				
Navilus Vera	C. O'Sullivan, Greenmount	11,038·69	392·95	Charmer of Glenleigh
JUNIOR, 3 YEARS OLD (UNDER 3½ YEARS), STANDARD 270 LB.				
Kyabram Marie	A. H. E. Black, Kumbia	9,424·65	374·976	Ledger of Greyleigh
SENIOR, 2 YEARS OLD (OVER 2½ YEARS), STANDARD 250 LB.				
Navillus Olive	C. O'Sullivan, Greenmount	9,249·5	365·816	Midgets Shiek of Westbrook
Rosemount Doreen 18th	P. D. Frechtner, *via* Greenmount	8,046·08	341·953	Bright Star of Cosey Camp
Millstream Molly	W. J. Barnes, Cedar Grove	8,041	323·335	Magnet of Kurrawong
Rosehill Dahlia	W. Flesser, Boyland	7,278·63	312·84	Philiquil of Oakvale
Kingsdale Bella	A. A. King, Mooloolah	6,801	285·761	Diamond Boy of Burradale

Junior, 2 Years Old (under 2½ Years), Standard 230 lb.				
Lyndith Primrose	S. H. Teese, Veresdale	6,270·12	245·374	Brooklyn Terrace President
Euroa Rosebud	H. L. Lindenmayer, Mundubbera	5,991·5	239·214	Swagman of Clonagan
FRIESIAN.				
Senior, 2 Years Old (over 2½ Years), Standard 270 lb.				
Oaklands Stella Rock 4th	W. Richters, Tingoora	8,207·74	310·644	Pied Rock
JERSEY.				
Mature Cow (over 5 Years), Standard 350 lb.				
Seycombe Glory's Garland	C. T. Seymour, Coalstoun Lakes	7,985·6	453·643	Carnation Royal
Seycombe Golden Peach	C. T. Seymour, Coalstoun Lakes	6,282·05	371·592	Carnation Royal
Seycombe Genuine Gold	C. T. Seymour, Coalstoun Lakes	5,945·75	356·856	Carnation Royal
Seycombe Myrtle	C. T. Seymour, Coalstoun Lakes	5,932·6	354·537	Carnation Royal
Seycombe Golden Glimmer	C. T. Seymour, Coalstoun Lakes	6,093·05	353·711	Carnation Royal
Junior, 2 Years Old (under 2½ Years), Standard 230 lb.				
Glenview Larkspur	F. P. Fowler and Sons, Coalstoun Lakes	4,448·25	267·765	Carlyle Larkspur 2nd Empire
Glenview Milkmaid	F. P. Fowler and Sons, Coalstoun Lakes	4,226·8	266·025	Carlyle Larkspur 2nd Empire

Answers to Correspondents.

BOTANY.

Replies selected from the outgoing mail of the Government Botanist, Mr. Cyril T. White, F.L.S.

Wild Millet.

J. B. (Marbango, Western Line)—

The specimen is *Echinochloa crus-galli*, commonly known as Wild Millet. It is a good grass, very closely allied to the well-known fodders White Panicum and Japanese Millet, of which it is supposed to be one of the wild parents. It is widely spread over the warmer regions of the world, and several forms of it occur wild in Queensland. Seed of it is not stocked, so far as we know, by nurserymen, and if you wished to propagate the grass you would have to keep seed from your own plants.

Hop Clover.

G.B. (Gympie)—

The specimen is *Trifolium procumbens*, the Hop Clover, a native of Europe, now widely spread over most warm temperate countries. It is very common in parts of Australia, especially in the Southern States. In Queensland it makes its appearance in the winter months, seeds in the early summer, and dies off on the approach of the real hot weather. It is an annual clover not stocked by seedsmen, but once it establishes itself it generally comes back each year from self-sown seed. Like most of the annual clovers, it makes good feed during the spring and late winter months when often other feed is not available. This year has been an exceptionally good year for clovers and trefoils.

Fuchsia Bush.

J.H.C. (Charleville)—

We know that trouble has been experienced on several occasions on the Quilpie Trucking Reserve, and think that Fuchsia Bush is the cause. Fuchsia Bush is plentiful on the town common, and when eaten by travelling stock, particularly on an empty stomach, no doubt this plant, like others containing a prussic acid-yielding glucoside, causes severe mortality. Many of these prussic acid-yielding plants are eaten by ordinary browsing or paddock stock apparently without any ill-effects following. The mere fact that the town cows and the general grazing stock in the neighbourhood of Quilpie feed on the common, particularly on the Fuchsia Bush, without any ill-effects following is no indication whatever of the plant's effect on travelling stock.

These plants are not common agricultural weeds, and no special means of eradication are known, other, of course, than grubbing-out. If desired, the plants could be sprayed with a weak arsenical solution, but the use of arsenical sprays is exceedingly dangerous where stock are running. A spray such as "Weedex," containing calcium chlorate, could be tried at about 5 per cent. solution. This weed spray is not known to be poisonous to live stock in a diluted form, but its efficacy in destroying hard woody plants such as those you send has not been tried out.

Candle Nut.

W.J.M. (Tirroan)—

The nuts forwarded with your letter of 13th November represent the Candle Nut, *Aleurites moluccana*. The name "Candle Nut" arises from the fact that the seeds are very oily and in certain parts of the South Sea Islands, particularly in the New Hebrides, they are strung together and burnt in the form of a candle. They burn with a fair flame and a great deal of smoke. The tree is a native of North Queensland, but is also spread over the Malayan Archipelago and the islands of the Pacific. The majority of people seem to eat the nuts with impunity, but occasionally one hears of cases of people being made violently ill through eating the nuts. Probably if the oil has turned the slightest bit rancid the nuts are dangerous, causing severe vomiting and diarrhœa.

Australian Centaury; Groundsel; Blue Panic; Giant Couch.

H.R. (Cooroy)—

The specimen is *Erythræa australis*, the Australian Centaury. This is a fairly common weed in paddocks in the coastal parts of the State from the Tweed to Wide Bay. The plant is not known to possess any harmful properties. It is, in fact, collected by some people and used as a tonic, the English Centaury being supposed to have considerable value in this respect.

The other specimen you forwarded under the name of Saltbush is the Groundsel Bush, *Baccharis halimifolia*, a native of South America, now a great pest on the North Coast line, particularly on the low-lying swampy country. Cattle eat this bush when hard pressed, but it has no fodder value. It has been suspected of possessing poisonous properties, but feeding tests carried out at Yeerongpilly some few years ago showed the plant to be harmless, though almost destitute of any nutritive value.

Regarding Blue Panic, *Panicum antidotale*, we should say the best time to plant this would be during the spring or summer. The present time future of *Panicum antidotale* will be more or less as a cultivated grass is excellent. As you say, root-planting is tiresome, though we think the in small paddocks of two to five acres as a standby for raising in the same way as an ordinary cultivated crop.

Have you tried *Brachiaria mutica*, better known as *Panicum muticum* or Giant Couch? This should be an excellent grass for some of the country about Cooroy. It is a tropical grass, and in the southern parts of the State is probably best handled in small paddocks for grazing purposes. We recently saw a small cultivated plot of it near Coolum, and were informed by the owner of the property that, when cultivated, this grass would carry up to three and four beasts per acre.

Gardenia Ochreata; Cocksburr Thistle.

O.L.H. (Mareeba)—The specimens forwarded with your letter of 17th November have been determined as follow:—

The tree from Mount Garnet is *Gardenia ochreata*, a small tree or large shrub of the family Rubiaceæ. It is fairly common in North Queensland but we have not heard a local name given to it. It bears a fair-sized fruit, but we do not think this is edible, though it is not known to be poisonous in any way. If desired to propagate the tree it should be easily propagated from seeds.

The weed from the farm at Kairi is *Centauria melitensis*, Cocksburr Thistle, or Saucy Jack, a native of Southern Europe, now a naturalised weed in most warm temperate countries. It is an exceptionally bad weed in New South Wales and in parts of South Australia. In Queensland it is very common on the Darling Downs, but is less abundant in more coastal localities. When quite young it is eaten by stock, but soon becomes harsh and unpalatable.

Derris; Pyrethrum.

K.A.E. (Landsborough)—

We have three native species of *Derris* in Queensland, which have all been tested as insecticides. The best is *Derris trifoliata*, common in the north-eastern parts of the State, particularly from Mackay northwards. It also occurs in New Guinea and the islands of the Pacific, where it is known as Dynamite Plant on account of the custom of the natives of chopping up parts of the stem and throwing them in water to stupefy fish.

Regarding *Pyrethrum roseum*, the Department imported seeds of *Prethrum* some time ago and distributed them to several parts of the country. We should think as far as cultivation is concerned *Derris* would have more possibilities in Queensland than *Pyrethrum*, because the Japanese, we understand, flood the market with *Pyrethrum* at a very low price.

Mossman Grass.

J.J. (Marlborough)—

The specimen is *Cenchrus echinatus*, a grass that is said to be a native of tropical America, but is now widely spread over most tropical countries. In Queensland it is most abundant in the north-eastern parts of the State. It is a bad burr grass, and, we should say, would have little value as a fodder. In North Queensland it is commonly known as Mossman Grass or Mossman River Grass.

Cotton.

J. INMAN (Goodenough Island)—

The Director of Cotton Culture, Mr. W. G. Wells, advises:—The sample of cotton submitted is probably a descendant of the old Caravonica variety. Sample rather weak for this type, variable in length, ranging from 1 1/16 in. to 1¼ in. Difficult to estimate value, owing to limited demand for this type of cotton.

Black Bean or Moreton Bay Chestnut.

C.F.F. (Kairi)—

The specimen is the seed of *Castanospermum australe*, the Black Bean or Moreton Bay Chestnut. The seed, when eaten by cattle, causes severe gastro-enteritis, sometimes resulting in death.

C.B.P. (Barcaldine)—

The specimen bore neither flowers nor seed pods, but we should say it represents the rather young growth of the Rubber Vine, *Cryptostegia grandiflora*, a shrub or vine that is cultivated in Northern and Central Queensland as an ornamental plant. In some places it has run out and become more or less of a pest. No feeding tests have been made with the plant, but it belongs to a dangerous family. If the calf had been feeding on the plant we think it is most likely the cause of the trouble.

Method of Polishing Bullock Horns.

N.L.P. (Jambin, Callide Valley)—

The Senior Instructor in Pig Raising, Mr. E. J. Shelton, has kindly supplied the following information:—

Method 1.—To polish bullock horns, first soak them in warm water until the core can be removed. Smooth by rasping, scraping with the edge of glass and sand paper, using fine emery paper last; then rub with a cloth moistened with linseed oil dipped in emery powder, finally rubbing and polishing with the hands. They may be more readily handled by tapping in a piece of wood and holding in a vice.

Method 2.—Scrape well with glass and afterwards rub with finest glass paper; then with powdered bath brick and oil, and finally with rotten stone and flannel or felt. Scrape with glass to remove any roughness; then grind some pumicestone to powder or buy it in powdered form, and with a piece of cloth wetted and dipped in the powder rub them until a smooth face is obtained. Next polish with rotten stone and linseed oil and finish with dry flour or a clean piece of linen.

Method 3.—Rasp them to take the outside rough shell off, then scrape well till the colour shows up, using rough sandpaper; then scrape and finish with a fine piece of glass. For polishing use vinegar and whiting and finsh with a piece of silk.

Another method is, after taking off all rough surfaces, to fill the horns with kerosene till it penetrates through. Pour out then and polish with oxide of tin and rub with a kerosene rag till all scratches are out. Then with a little dry powder on finish off with friction with a soft hand or piece of silk. Any of the ingredients mentioned above can be purchased through local stores in the country or at city stores.

Tanning Wallaby Skins.

N.L.P. (Jambin)—

The length of time it takes to tan a wallaby skin by the brigalow-bark process would depend entirely on the strength of the tan liquor used and the size of the skin. Brigalow bark is rarely if ever used in commercial tanning, the wattle bark method being considered superior in every way; in New South Wales oak bark is mostly used as an alternative to wattle bark where the latter is not available, and takes about the same time.

Some tanners consider brigalow bark tanning only suitable for hard leather like sole leather, and not as suitable a bark as wattle bark for marsupial skins.

Blue gum bark is also to be preferred, although it is a slower process.

Time taken always depends on the thickness and size of the skin, but it is usually from two to four weeks, and if fur is left on they only tan from one side through the pelt. It is suggested as a wise procedure to cut off a small portion to try the tan and time taken. If any white patches are observed the skin is not properly tanned and will be soft and will not keep well.

Plant Affecting Pigs (*Teucrium argutum*).

G.B. (Gympie)—

The specimen is not the plant familiarly known as Wild Mint, which has come into prominence so much of recent years as the probable cause of losses in stock on the Darling Downs. It belongs to the same family, however. It is *Teucrium argutum*, a plant for which we have not heard a common name. It is seen in pastures, also in cultivation. It develops large white underground runners. These, when turned up by the plough, are greedily sought after by pigs. It sends them into a very excited state and they rush madly about. They recover after a short time.

Sudan Grass, Its Poisonous Properties; *Paspalum Urvillei*.

A.L. (Ipswich)—

In reply to your inquiry about the poisonous properties of Soudan grass, the Agricultural Chemist advises that fatalities with Soudan grass are very rare. As a rule grazing on this grass is fairly safe. Experience shows that the poisonous principle when it develops is most likely to occur in the very young growth stages. The poisonous principle is much more rare in Soudan grass than in the common Sorghum.

The sample of grass you send is *Paspalum Urvillei*. This is closely allied to the common *Paspalum*, but is inferior to it in palatability and nutritive properties.

PIG RAISING.

Replies selected from the outgoing mail of the Senior Instructor in Pig Raising, Mr. E. J. Shelton.

Spots on Large Whites—Crown on Rump.

R.A.S. (Abercorn)—

(1) With regard to blue spots or freckles on the skin of Large White pigs, it is apparent that this objectionable feature appears in the White breeds the world over and is one of the faults to be guarded against. The standard of excellence printed on page 56 of the current issue of "The Australian Stud Pig Herd Book," states, in regard to colour, skin, and hair—

> "Hair white, free from black hair, and as far as possible free from blue spots on the skin; skin fine and free from wrinkles; hair long and moderately fine—10 points."

It is apparent from this that blue spots on the skin would not debar an animal from competition, but of course it is quite possible and more than likely that a judge would eliminate animals showing more than one or two blue spots. Strangely enough, these blue spots usually occur just above the eyes and under the ears, though why this should be is difficult to explain. We have always regarded spots on any other part of the body as more objectionable than spots above the eyes, and we know other judges who do the same. Quite recently, in an inspection of a litter of Large Whites, several pigs were noticed with probably twenty blue spots distributed over the rump and loins, and it would not be difficult to understand in this case that these animals would be debarred from competition; nor should they be used as breeders on account of risk of transmission.

(2) *Crown on the Rump.*—The following may be regarded as distinctly objectionable features in Large White pigs:—Black hairs, black spots, a curly coat, a coarse mane, short snout, inbent knees, hollowness at back of shoulders; in fact a few years ago these objections were published with the standard of excellence. A crown or swirl or cowlick on the hair of rump or back is, in our opinion, very objectionable from a show point of view, although there are no instructions in the herd book that they are to be regarded as such. Like the blue spots, there is always the risk of transmission of these faults to the progeny, and as the "very best" only should be used as breeders animals with faults like this should be culled. They could be used for crossbreeding. We are also of opinion that, if a stud breeder sells faulty animals as stud stock he is not keeping faith with the Society, which trusts breeders of stud pigs to sell none but the best approved animals, and on that account does not pay inspectors.

The better marked animals are always worth a guinea or two more than mismarked stock, and it is up to breeders to sell the very best.

The Pig's Diet.

M.A.B. (Yelarbon)—

The Director of the Animal Health Station will advise you fully in regard to the health of your pigs, but, dealing with the question from a dietetic point of view, the trouble appears to be due to the feeding of indigestible fibrous matter leading to constipation and general digestive disorders. These chronic troubles weaken the animals to such an extent that paralysis sets in and they are then prone to develop other nervous and constitutional troubles, and perhaps to suffer severely from the effects of stomach and intestinal worms and possibly from bush tick poisoning—also a common cause of paralysis in young pigs.

You state that the pigs are nine months old and are only in forward store condition. This indicates a serious lack of knowledge in the feeding and care of pigs, for pigs should be marketed as prime baconers before they are six months old if they are to be profitable, and as heavy baconers before seven months of age, and at that age probably they would be too heavy for best market requirements.

Perhaps they are slow-growing because they are not properly fed or, may be, it is their breeding, care, and attention that is at fault, just as much as their feeding. It may so happen that they have been fed on decaying curd or the thick dry curd that forms on the sides of milk vats, &c., and that loosens during wet weather, and in falling into the food contaminates it to such an extent as to make it poisonous (protein poisoning); or it may so happen that the pigs may have died of heatstroke caused by exposure to the sun and by lack of sufficient drinking water. These are all possible causes, and in the absence of inspection you will realise it is difficult to locate the exact cause. The district Stock or Dairy Inspector would advise you in your difficulty.

Change the pig's food—add tablespoonful doses of cod liver oil to those that are sickly. Keep the bowels open by repeated doses of epsom salts and the use of plenty of green lucerne or other green food, and compel the pigs to take regular daily exercise in a clean grassy paddock.

DAIRYING.

Lime in Calf-feeding.

A.B. (Nanango).—The Supervisor of Dairying, Mr. Chas. McGrath, advises as follows:—

Lime is a necessary constituent for all classes of domestic animals. The addition of lime to the milk fed to calves is recommended. It renders the curd portion of the milk more readily digestible and acts in correcting acidity in the stomach, and adds to the supply of lime for bone formation.

Lime water can be conveniently made available on the dairy farm. Water will dissolve only a definite amount of lime, 10 grains to a pint.

To prepare a stock of lime water add about 20 lb. lime to 10 gallons of water in a wooden barrel, and stir thoroughly. Then allow to settle. Smaller quantities could be prepared in earthenware or glass containers. The clear liquid present on settling is a strong (concentrated) lime solution ready for use. A wineglass full (2 oz.) should be added to each gallon of skim milk fed to the calves.

Water may be added to the stock supply of lime water as required and well stirred until all the soluble portions of the lime are dissolved, when a fresh supply of lime should be added to the barrel and well stirred.

When calves are put on to a skim milk diet a concentrate should be added to replace the butter fat. There are a number of suitable calf foods on the market.

A gruel can be made from 3 lb. crushed linseed and 2 lb. pollard added to 4 gallons of water and carefully mixed so as to avoid lumps forming. Boil slowly for thirty to forty minutes. One pint of the gruel should be added to each gallon of skim milk to be fed to the calves. A small quantity of the gruel or a calf food could be added when it is first fed to the calves, so that they may get accustomed gradually to the flavour, as the full allowance may cause the calves to refuse the food or may cause digestive disturbance.

CROWN LAND FOR GRAZING SELECTION.

APPROVAL has been given for the opening for prickly-pear development grazing homestead selection of land which was formerly heavily infested with prickly-pear in the Roma and Goondiwindi Land Agents' Districts.

One portion in the Roma Land Agent's District, comprising 10,352 acres, will be opened at the Land Office, Roma, on Tuesday, 6th February, 1934, for a term of lease of twenty-eight years, at an annual rental of ½d. per acre. This portion is situated 5 miles north of Yeulba, and is suitable for grazing cattle. The selection of this land will be subject to the ringbarking of 3,000 acres and the provision of one permanent water improvement during the first five years of the term.

Ten portions in the Goondiwindi Land Agent's District, situated from 16 miles to 60 miles north and north-west of Goondiwindi, will be opened at the Land Office, Goondiwindi, on Thursday, 8th February, 1934, for a term of lease of twenty-eight years, at annual rentals of ¼d. and ⅜d. per acre. The areas range from 8,800 acres to 30,000 acres, and one portion, which is suitable for sheep, is subject to a condition that it shall be enclosed with a fence which is both rabbit-proof and marsupial-proof, within three years from the date of the license to occupy. The remaining nine portions comprise cattle country.

Each portion is subject to special conditions requiring the ringbarking of areas ranging from 2,650 acres to 7,000 acres, and the provision of permanent water improvements within specified periods.

Free lithographs and full particulars of these lands may be obtained from the Land Agents, Roma, Dalby, and Goondiwindi, the Land Settlement Inquiry Office, Brisbane, and the Government Intelligence and Tourist Bureau, Sydney.

TO NEW SUBSCRIBERS.

New subscribers to the Journal are asked to write their names legibly on their order forms. The best way is to print your surname and full christian names in block letters, so that there shall be no possibility of mistake.

When names are not written plainly it involves much tedious labour and loss of valuable time in checking electoral rolls, directories, and other references. This should be quite unnecessary.

Some new subscribers write their surname only, and this lack of thought leads often to confusion, especially when there are other subscribers of the same surname in the same district.

Everything possible is done to ensure delivery of the Journal, and new subscribers would help us greatly by observing the simple rule suggested, and thus reduce the risk of error in names and postal addresses to a minimum.

General Notes.

Staff Changes and Appointments.

Mr. W. C. Jeffery, of Round Hill, Miriam Vale, has been appointed an Honorary Ranger under the Animals and Birds Acts in respect of the Captain Cook Memorial Reserve at Round Hill, which was recently declared a sanctuary under the Acts.

Mr. E. Jarvis, Entomologist, Meringa, will be transferred to Brisbane, and Mr. R. W. Mungomery, Assistant Entomologist, Bundaberg, will be attached to Meringa.

Messrs. J. Gunne (Helidon), J. J. Shelvey (Helidon), R. Pusey (Grantham), A. W. Noll (West Haldon), and J. Bishop (Kingaroy), Inspectors of Stock, Department of Agriculture and Stock, have been appointed also Inspectors under the Dairy Produce Acts.

Constable J. C. D. Doyle, Eulo, has been appointed also an Inspector under the Slaughtering Act.

Mr. F. J. Lentz, Numinbah, has been appointed an Honorary Inspector under the Diseases in Plants Acts.

Messrs. G. Bradbury and W. Harward, of Dunwich, have been appointed Honorary Rangers under the Native Plants Protection Act.

Messrs. F. R. Hugonin and A. Kehler, Magnetic Island, have been appointed Honorary Rangers under the Animals and Birds Acts.

Messrs. W. G. Hancock and K. King, agents under the Banana Industry Protection Act, have been transferred from Currumbin to Maryborough, and Maryborough to Currumbin, respectively.

Mr. J. W. Madill, of the Mirani Shire Council, has been appointed an Honorary Ranger under the Animals and Birds Acts.

Mr. S. A. Green, Inspector, Diseases in Plants Acts, Wallangarra, has been appointed also an Inspector under the Diseases in Stock Acts.

Banana Levy Regulation.

A regulation has been issued under the Fruit Marketing Organisation Acts, empowering the Committee of Direction of Fruit Marketing to make a levy on growers of bananas in Queensland, with the exception of those growers in the district from Nerang to the border, for whom a special levy regulation was issued in September last.

The levy is at the rate of one penny for every £2 or part thereof of the net proceeds from sales, and may be collected by agents, or persons holding to the credit of growers money on account of banana sales. The levy shall be collected by means of levy stamps obtainable from the C.O.D., which shall be affixed to account sales or credit notes.

In the case of bananas sold privately, the grower shall furnish a return of such sales to the C.O.D., and pay the levy due. Carriers of bananas shall furnish a monthly return to the C.O.D. of all fruit carried for market.

The sums raised by the levy shall be expended in the interests of the banana industry.

Levy on Stanthorpe Fruit and Vegetables.

A regulation issued under the Fruit Marketing Organisation Acts, empowers the Committee of Direction of Fruit Marketing to make a levy on growers of fruit and vegetables in the district being that portion of the State within a radius of 40 miles from Wallangarra, and in which area are situated the railway stations of Wallangarra to Dalveen, and Amiens to Fleurbaix. The levy will operate for a period of twelve months. The levy is at the rate of 1s. 6d. per ton of fruit and vegetables marketed, with a minimum of 1d. in respect of any one consignment by a grower who, in his own name or otherwise, contributes fruit or vegetables to any consignment. The levy this year replaces one of a lesser figure which has operated for about six years. The increase from 10d. to 1s. 6d. is made, firstly, for defraying the cost of the collection of the levy, and secondly, the balance shall form part of the Hail Relief Scheme Fund for the benefit of the growers in the district. The former levy of 10d. per ton was for the maintenance of the Deciduous Sectional Group Committee, although the bulk of the amount realised was actually used for hail insurance. This year, the whole of the proceeds, less cost of collection, will be devoted to hail relief.

Egg Board.

An Order in Council issued under the Primary Producers' Organisation and Marketing Acts, extends the operations of the Egg Board from 1st January, 1934, to the 31st December, 1938. An Order in Council was issued in October last, giving notice of intention to extend the Board, and inviting a petition from growers on the question of the continuance thereof. No petition was received, and the Order in Council formally extending the Board has accordingly now been issued.

Grade Standards for Plums.

A new regulation issued under the Fruit and Vegetables Act rescinds the existing grade standards for plums, and prescribes new standards. For the purposes of comparison, the following table sets out the grade standards approved in November, 1932, and those now approved:—

1932.—1¼ inch—Little Gem, Evans Early, Blue Rock, Tibbits, Early Orleans. 1¾ inch—Doris, Duffy's, Wright's Early, Santa Rosa, Wilson, Angelina Burdett. 1½ inch—Burbank, Giant Prune, Pond's, President, Grand Duke, Black Diamond, Magnum Bonum, Coe's Golden Drop, Kelsey, Wickson, Ballina, Shiro, Beauty, Formosa, Sultan, October Purple.

1933.—1¼ inch—Early or Little Gem, Evans Early, Blue Rock, Tibbits, Early Orleans. 1¾ inch—Doris, Duffy's. 1⅞ inch—Wilson, Angelina Burdett, Wright's Early, Santa Rosa, President, Grand Duke, Giant Prune. 1½ inch—Burbank, Pond's, Black Diamond, Magnum Bonum, Coe's Golden Drop, Shipper, Kelsey, Wickson, Ballina, Shiro, Beauty, Formosa, Sultan, October Purple, Narrabeen.

Cotton Board Election.

The election of six members on the Cotton Board resulted as follows:—

	Votes.
District No. 1—	
* John Beck (Stanwell) returned unopposed.	
District No. 2—	
* Harry Reeves Brake (Wowan)	149
William Kendall McLeod (Buneru)	76
District No. 3—	
* James Patrick Fleming (Biloela)	267
Ernest Schuenemann (Goovigan)	219
George Herbert Bradley (Argoon)	96
District No. 4—	
Edward James Basson (Three Moon, Monto)	194
* James Bryant (Chowey)	177
Johann Theodor F. C. Benecke (Abercorn)	86
Samuel Harding (Philpott Creek)	66
Erich Max Schenider (Binjour Plateau)	66
District No. 5—	
* David Charles Pryce (Toogoolawah)	152
Charles Litzow (Vernor)	54
District No. 6—	
* Ferdinand August Kajewski (Ma Ma Creek) returned unopposed.	

* Present member.

All of the sitting members with the exception of Mr. James Bryant have been re-elected and they will be appointed together with Mr. Basson to hold office for a term of two years as from the 1st January, 1934.

Papaw Levy.

A Regulation has been issued under the Fruit Marketing Organisation Acts empowering the Committee of Direction of Fruit Marketing to make a levy at the rate of 1d. for every four cases of papaws marketed during the period from 1st January, 1934, to 31st December, 1934. The regulation prescribes the method of collection of the levy, and provides that all sums raised thereby shall be expended only upon advertising in the interests of papaw growers.

State Wheat Pool Extended.

A Proclamation has been issued under the Wheat Pool Acts, declaring that the provisions of these Acts shall apply to wheat harvested during the seasons 1933-34, 1934-35, 1935-36, 1936-37, and 1937-38. The present Pool automatically expires when the last of the wheat raised in the 1932-33 season is marketed.

A provision is included in the Proclamation that 500 growers of wheat—

(*a*) Who furnished to the State Wheat Board a return of wheat grown on land of which they are the owners or tenants for the 1932-33 season; or

(*b*) To whom seed wheat has been supplied by the Board for this year's planting for delivery of the resultant grain to the Board from not less than 10 acres of land of which they are the owners or tenants; or

(*c*) Who have grown wheat for delivery to the Board from an area of not less than 10 acres of land of which they are the owners or tenants,

on or before 8th January, 1934, may make a request for a poll on the question whether or not they desire the continuance of the Wheat Pool for a further period of five years.

Northern Pig Board.

Mr. D. Johnston, of "Hillcrest," Malanda, has been elected chairman of the Northern Pig Board in succession to the late Mr. H. T. Skennar. The other board members include Messrs. Robert Campbell (Peeramon), Mr. F. W. Collard (East Barron), J. E. Foxwell (Kureen), A. A. Knudson (Millaa Millaa), and E. Graham (Director of Marketing).

The Board has been appointed from the 1st January, 1934, until the 31st October, 1934, in continuation of the work carried out during the several years past. The Board elects its own secretary, Mr. C. Dunlop, manager of the North Queensland Co-operative Bacon Association, Limited, having occupied this position in the past as the Bacon Factory at Floreat Siding, Mareeba, functions under the general oversight of the Board. The latter takes the form of a commodity board functioning under the Council of Agriculture in Queensland, and in that capacity controls the marketing of pigs in the Atherton Tableland and Cairns Hinterland districts of North Queensland. The Board has performed a very useful and necessary service, and in co-operation with the bacon factory has resulted in the permanent establishment of the pig industry in that portion of the State.

Citrus Standards.

The Minister for Agriculture and Stock (Mr. Frank W. Bulcock) announced recently that Regulations had been issued under the Diseases in Plants Acts, which were designed to safeguard the interests of future planters of citrus orchards, and to raise the standard of production of this fruit in Queensland.

The new regulations are the outcome of a scheme formulated by the Acting Director of Fruit Culture (Mr. H. Barnes) for the use by nurserymen of selected seed for raising root stocks, and budwood which has been specially selected by, or under the supervision of, an officer of the Department of Agriculture and Stock, from trees of outstanding merit.

In effect, added Mr. Bulcock, the new regulations provide that all citrus trees sold or offered for sale in this State must be on stocks grown from specially selected seed. In addition two grades are provided. "A" grade consists of the following best varieties:—

Oranges—Washington Navel, Valencia Late, Joppa, Jaffa, and White Siletta,
Mandarins—Emperor, Beauty of Glen Retreat, and Scarlet,
Lemons—Lisbon and Villa Franca,
Grape Fruit—Marsh Seedless,

which have been worked with budwood specially selected by, or under the supervision of, an officer of the Department of Agriculture and Stock.

"B" grade consists of all other varieties of citrus, the budwood for working which must be specially selected by nurserymen from trees displaying desirable charactertistics.

It is further necessary for all nurserymen who raise citrus trees for sale to furnish a return to the Director of Fruit Culture by not later than the 31st October in each year, setting out the names and addresses of persons to whom "A" grade citrus trees were sold, and the number of trees of each variety sold to individual purchasers. By this means a careful check will be kept on the sale of citrus trees to ensure that growers will be supplied only with the very best.

Heavy Citrus Crop in Prospect.

The Minister for Agriculture and Stock (Hon. F. W. Bulcock, M.L.A.) announced recently that he had received a report from the Acting Director of Fruit Culture (Mr. H. Barnes) that excellent early spring rains have been experienced over practically the whole of the main citrus-growing areas of the State, and there are now prospects of a heavy crop of this fruit during the coming season. It is likely there will be at least a 50 per cent. increase over last season's yield. A factor which should react very much in favour of the Queensland growers is that the early rains caused the trees to blossom earlier than usual in many districts. The fruit as a result is well forward, and much of it should find a good sale in Sydney and Melbourne before the Southern fruit is matured enough to market.

Bird Sanctuary at El Arish.

Clump Mountain Farm, the property of Mr. R. C. Fenby, at Clump Point, El Arish, has been declared a sanctuary under the Animals and Birds Acts. It will accordingly be unlawful for any person to take or kill any animal or bird on this property.

Animals and Birds Sanctuaries.

Two more sanctuaries for the protection of animals and birds have been declared under the Animals and Birds Acts, and comprise the Toomba Stud Holding west of Charters Towers, and the property of Mr. St. J. Robinson, at Townsville. Part of the lastmentioned property was declared a sanctuary in June, 1930, but the Order in Council issued recently provides for the extension of the sanctuary to include adjacent breeding grounds for birds.

Mr. C. Fuller (Mapleton), C. M. R. Glover (Obi Obi), H. Bishop (Kidaman Creek), C. J. Mitchell (Kidaman Creek), H. N. Gannon, J. Cochrane, and K. Baedelt (Woodbury, via Yeppoon) have been appointed Honorary Inspectors under the Diseases in Plants Acts.

Mr. J. C. Cuthbert, Toll Gatekeeper of the Mount Nebo road, has been appointed an Honorary Ranger under the Animals and Birds Acts and the Native Plants Protection Act.

Tung Oil Nuts.

As numerous inquiries have been received for seed of the Tung oil tree from persons desirous of experimenting in its growth, the Department of Agriculture and Stock has made arrangements whereby limited supplies of Tung oil nuts (*Aleurites fordii*) have been made available for distribution at the rate of 1s. 3d. per lb., including postage.

Applications, together with a remittance to cover the amount of the order should be forwarded to the Under Secretary, Department of Agriculture and Stock, Brisbane.

Cane Assessment at the Kalamia, Pioneer, and Inkerman Mills.

An Order in Council issued under the Regulation of Sugar Cane Prices Acts fixes the assessment that may be levied on every ton of sugar-cane received at the Kalamia, Pioneer, and Inkerman sugar-mills at 2¼d. per ton. This Order in Council amends the Order in Council issued on the 5th May, 1933 (which fixed a general assessment of 1¼d. per ton on sugar-cane received at any mill in the State) in respect of the three mills abovementioned, the levy of 2¼d. to apply as from the 5th May last.

The proceeds of this assessment are to be utilised in paying for the checking by survey of the correct areas of the cane lands assigned to the mills mentioned. This checking is necessary to enable the Central Cane Prices Board to issue official certificates as to the assignment of particular areas of land.

Egg Board.

The time fixed for the lodging of a petition in connection with the continuance of the operations of the Egg Board for a further term of five years closed at the Department of Agriculture and Stock recently, and for the first time no petition for a poll was received.

With regard to the election of five growers' representatives for a term of one year, four of the present members—namely, Messrs. R. B. Corbett (Woombye), District No. 1, A. A. Cousner (The Gap), District No. 2, Tom Hallick (Mount Gravatt), District No. 3, and Walter Thos. Hughes (Middle Ridge, Toowoomba), District No. 5—have been returned unopposed.

In District No. 4 Mr. Alexander McLauchlan (Boonah), the present member, is being opposed by Mr. H. J. Jurgensen (Moogerah).

Voting papers for this election will be sent to growers early this month, and the date fixed for their return is on or before December 29th.

Rural Topics.

Milking Capacity of Dairy Cows.

After recording the milk yields and taking detailed measurements of 461 pedigree and grade Holstein Friesian cows in Minnesota (U.S.A.), Mr. F. H. Garner writes interestingly in the "Journal of Dairy Science" about the relationship that he found to exist between the measurements of different parts of the animals and their milk- producing ability.

With regard to measurements indicating mammary development, the writer points out that the blood leaves the udder by six different veins, and that only two of these, the so-called milk veins, are visible. Where the veins turn suddenly upwards, some 6 to 12 inches from the forelegs, the milk-wells are produced. The question arose as to whether the milk-wells were larger on bigger cows not because of higher milk yields but to be proportionate to the frames of the cows. It was found that the size of the cow did not materially influence the size of the milk-well. Measuring size by the height at the hocks, and holding this figure constant, a positive correlation was obtained between size of milk-wells and milk yield.

The writer concludes that the total area of the milk-well will take the tip of the middle finger of a normal man, and although one would never attempt to judge a cow by one point alone, the size of the milk-wells is probably the best single point indicating milk-producing ability. It is further stated thot there may be a close relationship between the size of milk-wells in parents and the milking capacity of their daughters.

The writer also found that it was important that a cow should have a long body; the relationship here was not much but nevertheless significant. He found that the height of the hindquarters of the cow was more highly correlated with milk yield than the height of the forequarters. The co-efficient of correlation between yield and width at the hocks was also significant, and bears out the opinion of judges who prefer a cow with a large pelvis girdle.

With regard to constitution, a significant correlation was obtained between the circumference of chest and milk yield, but not between depth and width of chest, though the writer concludes that these last two measurements could not be so accurately made as the first. "Capacity" was measured by the width of barrel at the thirteenth rib, and by the circumference of barrel, and again a significant correlation was obtained.

The Milker's Hands and Bacterial Infection.

Dairymen who milk with dirty hands should consider the effects their slovenliness might have, not only on dairy products, but on their fellow-beings. Often this carelessness is due, not to lack of personal cleanliness, but to want of knowledge of bacterial life. Let every dairyman have a look at his hands when dirty, and ask himself if he would like to see the baker from whom he buys his bread kneading his dough with hands in a similar condition. He would say that such a baker was a dirty person, perhaps even use stronger language. Yet bread is subjected to a temperature in the oven high enough to kill the organisms, whilst milk is generally consumed in the raw state.

After the milking of each cow the milker should wash his hands in clean water and dry them; if this is not done bacteria that may be in the liquid on the hands may gain access to the milk in the bucket. It is unnecessary to defend washing on the score that any time expended on it is subsequently made up, for even if the time were actually time lost, its expenditure would still be well worth while. It is contended, however, that any time occupied in washing the hands is made up eventually by reason of the stimulating effect of the water on the hands of the milker. As a shower invigorates a tired body, so does a wash invigorate the milker's tired hands and wrists.

Supposing that fifteen seconds is taken up in washing the milker's hands and the udder in the case of each cow, and that one milker milks sixteen cows at a sitting, this would mean a total loss of about four minutes, but the increased speed of milking would easily make up this time. Moreover, as every dairyman knows, the more actively the milking is done the more the activity of the milk secreting cells is stimulated, hence more milk of better quality.—A. and P. Notes, N.S.W. Department of Agriculture.

The Milk Yield.

Analysis of statistical data from milk recording societies has disclosed that the milk yield is considerably affected by the length of time that elapses after the cow calves and before she is served, and by the length of the dry period.

Studies of the growth of the udder have shown that it commences at the twentieth week of pregnancy, at which time, if the cow is already in milk, the yield begins to decrease rapidly. Since the udder cannot both produce milk and develop its maximum growth, one or both functions must suffer. Cows which are milked up to the time of calving, accordingly yield much less milk during the next lactation period, a dry interval of forty to sixty days being required in order to produce full growth of udder tissue for the next lactation. The feeding of cows on a milk-producing ration during this period considerably increases the udder growth and consequently the milk yield during the following season.

Variety in the Cow's Ration.

In making up combinations of concentrates and roughages it is as well to remember that there are, unfortunately, very few foods that alone are able to supply a full range of all the essentials, and therefore the most satisfactory rations must, of necessity, include in their make-up a fair variety of foods from different plants. Care should be taken to avoid choosing roughages and concentrates that are derived from "the one stalk," as, for instance, wheaten chaff and bran, corn silage and ground maize meal, green oats and ground oatmeal, &c. The same idea can be extended to cover the undesirability of combining two substances that are deficient in the same essential, such as, for instance, maize meal and bran, both of which are lacking in lime.

The same principles apply in the growing of crops, and explain the remarkably superior results obtained from feeding a crop of oats that has been mixed with a certain percentage of legumes, such as peas, vetches, tares, &c., in order to make up for the deficiencies in the composition of the oats, or, say, a crop of green maize that has been mixed with either soy beans or lucerne to correct the same defect.

The Flax Industry—Little Prospect of Success in Australia.

Because of the large importations of linseed for the production of oil as well as the possibilities of an export trade in fibre, the Department of Agriculture in New South Wales has for many years been conducting experiments in an attempt to establish as an industry the growing of the linseed. Seed of a large number of varieties from all parts of the world where linseed is produced have been imported and tested, experiments being conducted at various experiment farms and in co-operation with many farmers under various conditions of soil and climate, but the results generally have been disappointing.

The probable reasons for the failure of linseed to thrive in this State are the irregularity of the rainfall and the short duration of the spring. The cereals, wheats and oats, are able to withstand dry spells which occur during their period of growth, but linseed appears to be checked by periods of scanty rainfall and by the high temperatures which are frequently experienced during the spring months.

Though the Department is continuing its experiments in an effort to discover means by which the crop can be produced profitably in this State, it does not at present encourage farmers to undertake the commercial cultivation of linseed.

That the experience in New South Wales has been similar to that in the other States of Australia is now evident from a report on the flax industry made available by the Development Branch of the Prime Minister's Department.

In this report it is pointed out that the world's price for flax, expressed in gold currency, is at present close to pre-war level and little improvement can be expected. Linen goods are not manufactured in Australia, and the only local market is the limited soft fibre requirements of rope and cordage manufacturers at present met by the importation of Italian hemp.

Experience has shown that climatic conditions render the greater part of Australia's farming territory unsuitable for the production of the crop and that the general quality of Australian fibre can only be ranked as medium to poor.

Unsatisfactory results have attended efforts to grow linseed, and until it can be demonstrated that the crop is profitable, farmers will not be interested in its cultivation.

Estimates of the cost of production of linseed indicate that a yield of 12 bushels per acre, at a price of £14 to £15 per ton would, at the present time, just about provide wages and pay expenses.—A. and P. Notes, N.S.W. Department of Agriculture.

Worms in Horses—Influence of Feed.

There is a totally inaccurate belief in the minds of many farmers that the common worms which infest horses are to be found readily in the mud of dams and creeks, pointed out the District Veterinary Officer to a recent New South Wales Bureau Conference, and the speaker went on to explain that such a belief renders the intelligent control of these parasites quite impossible.

There are many different types of worms which infest the stomach, small and large intestines of the horse, but the methods of propagation of all these worms is very similar. Tens of thousands of the smaller and most harmful species may be present in one animal, and each female of this huge collection lays thousands of eggs. The eggs pass out with the droppings and develop into larvae which are scattered all over the paddock, and it is the swallowing of these microscopical larval forms while grazing which causes the animal to become infested with worms, for the larvae develop to adults in the bowels; and so the process continues to the detriment of the horse population.

Horses do not often contract worms when they are in work, for the reason that they are being well fed and maintain their strength and resistance, and do not have the same opportunity of picking up the worm elements in the paddock. After harvest the horses are turned out for a so-called spell, often on feed which lacks nourishment; they lose their real strength and resistance and being always in the paddocks they pick up quantities of worm larvae and before long they are too weak and wormy to work.

It was suggested by the lecturer that all of this trouble could be avoided by looking after horses well at a lean time of the year when they are not in work. If good feed was not available and it was not possible to change the horses fairly frequently to a fresh paddock (and this was important), then good care should be taken that they receive some hand-feeding. In addition, it was well to learn to recognise when horses were getting "wormy" and see that they were drenched before it was too late.

Spread Manure—A Profitable Practice.

If the cow dung is not harrowed regularly after each grazing, they produce patches of rank growth which are left by stock throughout the entire season, said a lecturer at the recent Illawarra District Agricultural Bureau Conference at Camden (N.S.W.). This condition increases with each successive grazing and results in the loss of a large proportion of valuable grazing area; it may even happen that much of this manure-covered land, if not harrowed, will not be available for years unless ploughed in or removed in some way.

After careful observation it has been calculated that the year's manure from thirty cows contains fertility equal to that found in the following commercial fertilisers:—9 tons sulphate of ammonia, 2½ tons superphosphate, and 4½ tons sulphate of potash. At present prices these would be worth about £200 per year to the farmer, and would represent a very real contribution towards his farm's upkeep.

On the other hand, if the droppings are left unspread, the capacity of the pasture is limited in many respects. The wisdom of using the grass harrow to spread the droppings is therefore very apparent.

An Easily-made Tank Stand.

A suitable stand for a tank can be made by filling a ring of corrugated iron with sand. The ring should, of course, be well riveted, and it is also advisable to further strengthen it by means of hoops of fencing wire twitched up hard against the iron.

The greatest pressure on the floor of the tank will be about its centre, and it is advisable, therefore, to give the sand filling a slight crown at the centre so that the tank, when full, will settle with a level floor. The life of the floor of the tank, and also of the ring of galvanised iron, will be greatly extended if the surfaces coming in contact with the sand are given a wash of cement.

Prosperity and the Hen.

The business people in some of our poultry-farming centres do not always realise what a factor the poultry-farming industry is in the prosperity of their town. Take Parramatta, for instance. Approximately £300,000 worth of eggs and poultry are produced annually within a radius of 10 miles of this town, in addition to which probably £30,000 worth of day-old chicks are sold, and £200,000 is expended on supplies to produce this income. Probably if the townspeople of Parramatta and other business centres in the poultry-farming districts visualised what they owe to the humble hen they would, like the people of Petaluma, California, erect a statute of a hen in the main street.—A. and P. Notes, N.S.W. Dept. Agric.

Lucerne as a Pasture—Why Continuous Grazing is Detrimental.

For normal development a plant must have a certain amount of leaf surface for the conversion into available plant food of the mineral solutions absorbed from the soil by the roots, and because it interferes with this process, heavy continuous grazing is seriously harmful to lucerne. The correct method of handling the paddocks is to wait until the growth is approaching the bud or early flowering stage, and then feed it off rapidly by stocking the area heavily. It is advisable to have reasonably small paddocks, and to put large numbers of sheep on at a time to eat the area off in at least ten or twelve days. If the paddocks are large, temporary fences that can be erected rapidly and moved easily should be utilised for the purpose of subdivision.

In paddocks that are grazed the surface soil sets hard with tramping, and cultivation should be carried out at least twice a year, using springtooth or rigid fine cultivators fitted with special lucerne points. Top-dressings at 1 to 1½ cwt. superphosphate per acre should be made at least every second year. The fertiliser should be applied in July or August, working it in with a cultivator or heavy tripod grass harrow.

Hoven or bloat is likely to occur in sheep and cattle at any time if the animals are hungry when first turned on to the paddock, and the trouble is accentuated if the lucerne is wet with rain or dew. Once sheep become accustomed to feeding regularly on lucerne, however, very few deaths occur. A mixed pasture of grasses and lucerne minimises the danger to a considerable extent, as a variety of feed is available.

Having grass paddocks to which the sheep have access, adjacent to the lucerne areas will result in a better balance of feed than where only lucerne is available. This practice considerably reduces the danger of hoven, and also results in the life of the lucerne plants being extended, as the stock are not feeding on them continuously. It is the young, succulent growths of lucerne which cause most losses from hoven, and whenever possible the feed should be allowed to become more mature and reach the bud or early flowering stage before it is grazed off.—A. and P. Notes, N.S.W. Department of Agriculture.

A Call for Courage—A Message to Modern Youth.

Arthur Mee, whose books and papers have been read by millions while this generation has been growing up, has been looking around the world, seeing Youth everywhere waiting for its opportunity, listening impatiently to its suggestion that it has no chance in these days. This is the message contained in the preface of a new book he has made:

"It is not true that there is no chance for Youth in this twentieth century. There have been dark days before and men have faced them. What Youth needs is not Opportunity but Courage.

This generation has seen millions pass through the fire; it has seen an outburst of heroism unparalleled since Time began. The end of that vast stricken field is the ruin of the world, and everywhere the call is for heroes who will build it up again. The cry is for the courage that will not fail, the spirit that will not quail, the eager brain that sees the boundless chances of this brave new world.

All through the ages there have been such men, such women. If life is hard to-day it was harder a thousand times for them, but they went on. They did incredible things. They made the world we live in."

In his new book Arthur Mee tells us their stories. There is the slave writing the fables every child loves. There is Captain Cook making the British Empire possible, Faraday peeping into electric mysteries, Clerk-Maxwell founding the Wireless Age with nobody believing him, Gurney dreaming of motor cars with everybody mocking him, Hargreaves the Australian making his aeroplane models and scoffed at as a crank. (Because there was no room for Hargreaves's models at Canberra they eventually found a home in a German museum and were regarded as of priceless value to German aeroplane designers before and during the war.) There is Cervantes pulling at a galley oar with Don Quixote rippling in his brain, Grotius locked in his box with the League of Nations in his mind, and many more tales of human achievement against the greatest possible odds in every age, and of men who made our race immortal. "Time is calling again for those who will build a world," and in the great records of our own land, and especially in the lives of Australian pioneers, our youth will find its inspiration. "What Youth needs is not Opportunity but Courage—the courage that will not fail, the spirit that will not quail, the eager brain that sees the boundless chances of this brave new world."

Care of Eggs on the Farm.—Important Points.

Much can be done by the poultry farmer to preserve the quality of eggs going to the market, yet in some instances there is an astonishing carelessness in handling this perishable commodity. One of the first considerations is the nesting arrangements—it is essential that sufficient nests be provided to prevent crowding, which causes breakages and dirty eggs. The nests should be kept clean, as should the houses, so that the number of soiled eggs is reduced to a minimum, because any dirt on the shells, particularly those which are porous, may lead to infection by harmful bacteria, thus causing the eggs to go bad quicker than if they were clean. The trouble would be accentuated if such eggs, while being washed, were allowed to stand soaking for any length of time in dirty water. This should be avoided by placing the eggs in a receptacle with a perforated bottom and immersing them in water for a few seconds, afterwards washing them in clean water.

Where heavy breeds are kept it is essential that broody hens be handled systematically, so that they do not sit on the eggs and thus cause deterioration, particularly if the eggs are fertile—if they were sat on for twelve hours incubation would commence, and, of course, the eggs would quickly go bad. To avoid this risk the best method to adopt is to have portable crates, with slatted bottoms and divided into two or three compartments so that each day's "broodies" can be placed in a separate compartment. It is important that all broody hens be caught each day. This not only helps in keeping up the quality of eggs, but saves loss of production, because by catching the hens as soon as they go broody they will be off the brood again in a few days, whereas if they are allowed to sit for two or three days they will be off laying longer.

Another matter bearing upon the quality of eggs is that of correct feeding. For instance, if green feed is fed to excess in place of more nutritious food, this will lead to watery albumen in the eggs. On the other hand, a too highly concentrated ration will cause a greater percentage of blood spots, which are objectionable in a fresh egg and affect the keeping qualities. Again, a regular supply of suitable shell grit is an essential in ensuring sound shells.

Finally, the method of storing eggs on the farm awaiting despatch to market often leaves much to be desired. The room in which the eggs are kept should be free from mouldy or musty odours, and, while allowing sufficient ventilation, must not be too draughty. The temperature of the room is another important matter, especially in the hot weather, when the eggs should be kept as cool as possible. Where a cool room is not available the best course to take is to pack the previous day's eggs early the next morning, and, after packing, cover the cases over until they are sent to market.

On no account should eggs be allowed to stand exposed to the air during the warm weather, as this leads to rapid evaporation, and results in eggs being rejected as stale.—A. and P. Notes, N.S.W. Department of Agriculture.

Correspondence Course of Instruction in Pig Raising.

This course which has been in operation since the 1st March, 1932, has proved to be one of our most effective means of instructing farmers in the subject of pig raising, and has been the means of interesting many farmers in the improvement of their pig breeding and housing methods. The letters of appreciation frequently received from those receiving the course are very encouraging and indicate that the instruction given appeals to the interested farmer.

Up to the present, 206 students, aged from 14 to 40 years, have commenced the course; 17 of these have completed and 80 are still enrolled; 109 commenced but discontinued the study at various stages of the course. Some of those who have dropped the study have explained that circumstances, such as change of employment and seasonal work, have made it impossible for them to continue. Others give no reason for their discontinuance, and in many cases it is probably due to negligence.

If a student gets a month behind in his work he is sent a circular letter reminding him that he is expected to complete the course; this sometimes has the effect of bring him back to his study.

Although a student receives benefit even if he only pursues a small portion of the course and the time spent on him is not wasted, it is most desirable that when a student enrolls for the course he should complete it within the specified time of one year.

The Hydraulic Ram.

An ample supply of fresh water is often a problem on many dairy farms and, paradoxical though it may seem, this problem is often most acute in districts where the yearly rainfall is heaviest—the rainfall is seasonal and there is rarely any means of conserving supplies for the drier months. It is seldom, however, that running water cannot be found on a dairy farm in the coastal belt, although, admittedly, it is sometimes difficult of access. Furthermore, on the hilly dairying lands much energy is expended by cattle in travelling to and from the water supply. This results in lessened production. How much better to have drinking troughs quite handy and fed regularly with fresh water from these otherwise inaccessible sources by means of a hydraulic ram! The supply thus made available can also be made to supply water for the household and dairy.

When properly installed and adjusted the hydraulic ram will work day and night if necessary without attention; in other words, it is a close approach to perpetual motion. The only essential is a fall or "head" of water. The quantity of water a ram will deliver varies under different conditions, but it may be taken as a general rule that one-seventh part of the water which enters the ram can be raised and discharged four times as high as the "fall" applied. Thus a fall of 10 feet would raise 1 gallon out of every 7 entering the ram 40 feet high, or half a gallon 80 feet high.

Considering the comparative cheapness of a ram and that the cost of operating and upkeep is nil, it is difficult to understand why it is not more generally utilised on farms. The only conclusion that can be come to is that it is not appreciated because it is not understood. Its construction and working are so simple that farmers could not be blamed for regarding with scepticism many of the claims made for this machine. What it will do and the principles on which it works, however, are set out very clearly and briefly in the current issue of the "Agricultural Gazette" of New South Wales.

Cheese a Valuable Food.

It has often been said—indeed, it has become quite a common saying—that cheese is indigestible, and should, therefore, be avoided by anyone subject to digestive troubles. On the contrary, points out a departmental dairy instructor in the N.S.W. "Agricultural Gazette," when cheese of choicest quality is matured, it is in actual fact more digestible than many other foods we eat, and is often specifically recommended by medical authorities, not only for people in normal health, but for those suffering from dietetic troubles. Food analysts tell us that 1 lb. of cheddar cheese contains as much protein as 1½ lb. of sirloin beef and 1¾ lb. of white poultry flesh, and, on the basis of the energy it supplies to the human system, that 1 lb. of cheddar cheese is equal to 2 lb. of sirloin beef or 2½ lb. of white flesh from the breast of a fowl.

What a difference in energy value there must be then between a meat sandwich and the tasty cheese sandwich, and what an astounding difference it would make in the quantity of cheese consumed every year if only half of the people in this State ate daily the quantity of cheese it takes to make a full sandwich, say, half an oz.

Green Peas—Cultivation on Trellises.

On the New South Wales coast, particularly in the Gosford and Dora Creek districts, the growing of green peas on trellises is a common practice, and is particularly suitable for small growers in these and similar districts. The advantages claimed for this system are many. The yields are increased, picking is rendered easier, less disease is present on the haulms, the rows are more easily cultivated and kept free of weeds, and the plants are not affected so much by continued wet weather.

The method of constructing the trellis is as follows:—Stout stakes 5 feet long are driven 6 inches into the ground at intervals of about 20 feet along the rows. As the peas grow, horizontal wires a little thicker than tie wire are alternately spaced on both sides of the stakes every 6 or 8 inches, or in pairs at the same distance, up to a height of 4 feet 6 inches, according to the growth of the vines. The wires are strained to stout short pegs at each end of the rows. The rows are usually spaced about 4 feet apart. Yields of up to 400 bushels per acre have been obtained by this method, according to reports.

A modification of the method, and one often employed by backyard vegetable growers, is to use sticks and bushes to support the plants.

Fodder a Form of Stock Insurance.

Adequate fodder conservation is merely another term for insurance. Secondary industries have long since recognised the necessity of covering their operations with adequate insurance, and the need of primary industries in this respect is considerably greater.

As to the benefits to be derived from advanced business methods as expressed in the storage of fodder, one has not to go far for examples. In practically every district are to be found producers whose initial step on the ladder of prosperity has been made possible through foresight and good management in having available reserves not only to enable them to obviate losses in their stock but to swell their revenue by availing themselves of the drought fodder prices. Progressive methods, following the lines of crop rotation, lucerne culture, and pasture improvement have materially increased the carrying capacity of the holding. Full use is invariably made of this increased capacity by additions to the farm flock, which in turn involves fodder conservation.

Ample reserves of fodder permit of stocking to the full capacity year in and year out without undue anxiety and risk, and at the same time permit of securing the maximum monetary return. One has not to await recognised droughts to obtain the benefits of fodder reserves. The judicious feeding of sheep during the unfavourable periods which occur every year or two will be amply repaid in the increased return from the wool clip. Droughty stretches of even minor severity invariably leave their mark in the growth of wool, and the assurance of a free, sound, healthy-growing staple yearly will do much towards establishing a reputable and sought-after clip. Further, in the production of fat lambs it is essential that they receive no check whatever if a product of high quality is to be obtained. A ration of crushed oats at a vital time may mean the turning point in favour of a first-class product.

It is merely a recognised business practice to share one's risk per medium of insurance, and for the farmer the most effective means of accomplishing this is to provide adequate forage supplies. By this means he guards against the undue depreciation of his assets, at the same time guaranteeing continuity of production and revenue.—A. and P. Notes, N.S.W. Dept. Agric.

Bush Fire Control.

The strong growth of grass that has followed spring rains in many parts of the State will dry out with the advance of hot summer weather, and unless adequate steps are taken to control outbreaks of bush fires, serious damage to property and losses of stock are likely to be the result. In these difficult times, especially, primary producers should take every possible precaution to ensure that avoidable losses do not occur, and one of the means by which this may be achieved is the immediate formation of efficient fire-fighting units, by means of which it is comparatively easy in many districts (especially open country) to control bush fires.

The value of bush fire brigades has been well proved in many Western localities of New South Wales—for example, the Griffith-Hillston and Parkes districts, where within the past few years several serious fires have been quickly brought under control by fire-fighting units before any great damage was done.

Already this season a number of fires have occurred in the Southern States, thousands of acres of grass having been destroyed in the Jerilderie district and haystacks and even farm buildings in other localities.

Primary producers generally should profit by these experiences and give timely consideration to the formation of efficient fire-fighting units in their districts, and so provide for minimising the damage from bush fires. This is a movement that could well be taken up by branches of the Queensland Producers' Association, which should experience no difficulty in securing both the executive and the personnel.

When fighting bush fires, systematic and capable organisation may be said to be the essentials to success, and for a brigade to attain the peak of efficiency and usefulness it must have, not only the loyalty of every member of the unit, but also the wholehearted support of every section of the local community. Commercial and other interests in rural districts should realise that loss is never individual—it is always felt throughout a community—and that they can effectively assist in the provision of adequate protection from fire losses, not only by direct subscription, but also by the supply of equipment at landed cost.

Scours in Calves.—Various Causes.

Any irritant material eaten by calves is likely to set up inflammatory changes in the stomach and bowels, and thus, where the animals have had access to poisonous substances, or poisonous plants are growing in the paddocks, consideration should be given to these conditions when endeavouring to ascertain the cause of the occurrence of "scours."

Poisons containing arsenic are employed for so many purposes, such as sheep and cattle dipping, weed destruction, &c., that there is a tendency to overlook the poisonous and dangerous nature of the material used, and there is frequently a lack of care in its handling. Arsenical preparations often have a salty flavour and are readily licked by stock.

Certain plants, too, are capable of causing gastritis and enteritis, and when seasons are dry cattle will often eat herbage and shrubs which they would leave untouched at normal times. For instance, bracken fern is commonly eaten in such circumstances and may be responsible for considerable loss. There is therefore necessity for a careful survey of the paddocks where the sickness and mortality are occurring, so that any evidence that plants, usually not eaten, have been taken by cattle, can be observed.

More common and significant types of scours, however, are those due to microbes in the bowel, and to parasites in the bowel.

Zebu Cattle.

The proceedings for 1933 of the American Society of Animal Production contains a paper dealing with the growth of different types of cattle in Louisiana, including crosses with the Brahman (Zebu). The writers state that the Brahman is pre-eminently a grazing animal and makes good gains on coarse grasses. The Brahmans do not appear to suffer to the same extent from flies, mosquitoes, and external and internal parasites. They also stand the heat better. Further, at the Louisiana Station no Brahman grades have died from bloating on clover, while losses among the breeds of British origin are sometimes severe. The authors state that the principal advantage of the Brahman lies in its capacity for making gains on grass alone, a quality that is of great importance on the coastal plains.

Importation of Stud Pigs.

In recent months several valuable stud pigs have been introduced into Queensland from overseas and other States, all with a view to strengthening existing studs and building up foundation stock in the pig industry.

Notable among the importations are the two Berkshire sows recently released from quarantine and now on the property of the owner, Mr. F. Bach, of Oakey. These sows represent the very best it is possible to obtain in the United Kingdom, and, in fact, one sow, Lenton Patience, was a first prize winner at the Royal Agricultural Society Show, Yorkshire, England. She has farrowed her first litter since arrival and is doing well. The younger sow, a full sister to another very prominent prize winner, has been mated to the champion boar at the Farm Home for Boys, Westbrook.

The Queensland Agricultural High School and College secured one of the most attractive Berkshire boars offered at the Melbourne Show sales. This boar, himself a first prize winner, was much sought after and at auction would probably have realised considerably more than the price at which he was obtained.

The College also secured a very fine Berkshire sow and a Large White boar and a pair of specially selected Large White sows.

The most recent introduction is a prize-winning Tamworth sow purchased at the Melbourne Show for the Ascot Vale Stud Piggery, owned by the veteran breeder, Mr. W. S. Hendry, of Clifton. This sow, which had been on loan to the Victorian Department of Agriculture, toured the State on the Better Farming Train, prior to winning first prize at the Melbourne Show. A four months' old boar of her first litter also won first prize in a strong class at the same show. Mr. Hendry intends later on to mate this latest importation with his champion boar, Byron Challenger, the sire of which was champion at the Brisbane Royal National in 1932 and 1933. Although only a little over three years old he has a record of over forty first prizes and championships.

These importations, together with a distribution of stud pigs in the most popular breeds, and the large number that have been distributed through the Better Boar Scheme of the Department of Agriculture and Stock emphasises the importance of the industry and indicates a desire on the part of farmers to improve their breeding stock with a view to providing more intensively for local, interstate, and overseas markets.

Why Pigs Eat Charcoal.

Why do pigs eat cinders, charcoal, burnt corn cobs, and why do they persist in chewing bones? This is because their bodies demand a certain amount of mineral matter and such substances as charcool, burnt corn cores, burnt or charred bones, lime, ashes, all contain necessary mineral nutrients and in order to obtain these the pig satisfies the craving by indulging in the habits referred to. Give the pigs liberal supplies of mineral matters, sterilised bone-meal, and keep them growing and developing to advantage.

Gruel for Calves.

When the young calf is changed over from a diet of whole milk to one of skim milk, some form of concentrate should be added to replace the butter-fat that has been removed in separating. Experience has shown that an excellent addition is a thick gruel made from 3 lb. of crushed linseed and 2 lb. pollard, carefully stirred into 3½ or 4 gallons of water, and slowly boiled for at least half an hour. One pint of this should be added to each gallon of pasteurised skim milk, also one wineglass (2 oz.) of lime-water.

This gruel should be added in small quantities at first, so that the calf may become acquainted with the flavour, also so that its digestive system may adapt itself to a new class of food. If fed in full quantity at first the animal may either refuse the food or will be rather severely scoured by it.

How to Transfer Bees.

The objects of the compulsory use of frame hives are to facilitate the work of apiary inspection and the control and eradication of diseases found in bees. The best time to carry out the process of transferring bees from a box or other imperfect hive to a regulation hive with frames is in the spring during the first honey flow. Brood-rearing is not then in full swing, and combs are not overladen with honey. The danger of robbing is also minimised by the presence of nectar in the fields. The work should be carried out on a sunny day when most of the field bees are out.

First, prepare a standard-sized hive body complete with frames, and standard-size bottom board and cover. All the frames with the exception of one should be wired, and contain sheets (preferably full ones) of comb foundation. Give the bees in the box hive some smoke, and remove the hive from its stand, and substitute for the time being the frame hive minus the one empty frame; this new hive on the old stand will keep the field bees occupied for a while. Next turn the box hive upside down, remove its bottom board, and place an empty box, open side down, over the combs; have a neat fit if possible. Drum the bees up into the empty box by beating on the sides of the box hive with two stout pieces of wood. When completed remove the box now containing the bees and place it temporarily over the frames of the new hive on the old stand.

The combs may now be removed from the box hive. The best pieces of worker brood combs should be cut to fit neatly in the empty frame, and made secure with string fastened right around the top and bottom bars.

Next lift the box of bees from above the frame hive, and place the frame of brood about the centre of the frame hive; replace the cover on the frame hive, and then dump the bees from the box at the entrance of the new hive, and allow them to enter. It is usually best to dump a few first and see that eager entry is sought, and then bump the remainder out. The bees should make a contented start in their new home, having brood for inducement.

An Alternative Method.—After the first box hive has been successfully transferred as described and good headway made in brood rearing, other box hives may be transferred by what is known as the second method of transferring.

Secure a frame of brood (preferably with some larvae), and place it in a new prepared hive fitted with comb foundation. Invert the box hive, place the frame hive minus its bottom board over the combs, and then drum the bees up into the frame hive. When the drumming is completed, the new hive, now containing the bees, is placed on its bottom board on the old stand.

Remove the cover of this new hive and place a queen excluder over the frames; then on top of the excluder fit the old hive to act as a super for the time being. In three weeks a good brood nest should be established in the frames, and all of the brood in the old box above will have emerged, the queen being unable to return to it.

The box may now be removed and the bees drummed out of it into an empty box and then dumped in front of the new hive. The combs can be removed from the box hive and the honey and beeswax made use of. There is no loss practically with this method of transferring.—A. and P. Notes, N.S.W. Dept. Agric.

Is This a Farrowing Record?

Mr. Harry S. Pedlingham, a small farmer residing at Hardwick Farm, Colwall, near Malvern, Worcestershire, England, is the owner of a Large White sow that appears to be the world's most prolific and profitable pig.

On 8th January of this year this remarkable sow produced her nineteenth litter, bringing the total number of pigs that she has farrowed throughout her career to 353. The sow, despite the fact that she is now well over ten years of age is still in healthy breeding condition, and Mr. Pedlingham's ambition is to achieve a figure that will irrevocably establish the record for prolificacy for Great Britain for all time. Her owner expresses the conviction that 400 pigs would be quite a moderate estimate of the sow's breeding possibilities.

An outstanding feature of her breeding career is the fact that a litter well above the average number has been farrowed with the regularity of clockwork each and every six months since 12th December, 1923, when the sow commenced its record-breaking career at just under twelve months of age.

A further remarkable feature was the farrowing of three litters with a total of sixty-five pigs in the year 1930, and it is worthy of note that seven litters of twenty and over have been produced. Mr. Pedlingham attributes the large and consistent farrowings chiefly to contentment engendered by regularity of habits and feeding. The importance of weaning such large numbers and minimum of time to permit of a further farrowing in as short a period as possible was not overlooked. To achieve this later object correct and regular feeding was essential. Only first-class boars have been used. That the pigs were of good quality is substantiated by weight of age records. At nine weeks of age eight pigs from one litter were weighed and tallied as follows:—

Eight pigs weighing 50, 48½, 49, 49½, 48, 50½, 47, and 42. These pigs averaged 34 lb. at seven weeks of age—a good average indeed. To illustrate that the prolific characteristics of this sow have been passed on to the offspring, it is worthy of note that a sow farrowed in one of the litters of twenty-one born on 19th July, 1929, has already broken its dam's record over a given period. Another has so far made an average of sixteen to a litter and a boar that is now just over twelve months of age has achieved sixteen pigs in his first litter. The majority of the sow's offspring which have been disposed of for breeding purposes show the same gratifying results. The full details of the sow's farrowings up to 9th January, 1933, are shown below:—

Date.	Year.	No.	Date.	Year.	No.
2 December	1923	12	19 July	1929	21
15 June	1924	24	1 January	1930	24
28 December	1924	18	13 July	1930	21
11 June	1925	15	29 December	1930	20
25 December	1925	19	30 June	1931	16
24 June	1926	18	4 January	1932	14
2 January	1927	16	2 July	1932	18
3 July	1927	19	3 January	1933	16
5 January	1928	19			
29 June	1928	22	Total, 19 Litters		353
4 January	1929	21			

The Late Dr. Bancroft.

Dr. Thomas Lane Bancroft, who died recently at Wallaville, near Bundaberg, was the famous son of a famous father, whose memory is commemorated in scientific circles in Brisbane by the annual Bancroft lecture. Dr. Bancroft, the senior, may be regarded as the pioneer in Australia of medical research directed towards advancing the white settlement of our tropics. He came to Brisbane as a young English doctor, settled here, and gained an international reputation for his scientific work, particularly for his investigations into the cause of filariasis. Sir Ronald Ross, the later discoverer of the way in which malaria is spread by mosquitoes, acknowledged a heavy debt to the elder Bancroft. Dr. T. L. Bancroft carried on the work of his father after the latter's death in 1894, and his subsequent intensive study of the ceratodus furnished contributions to knowledge that were highly valued in the international world of science. Men such as he receive much less honour from their fellow citizens than a popular cricketer or footballer, but the honour they confer on the State will outlast most sporting laurels.—"The Queenslander."

Thought, Its Power, and how we fall down on the Job.

Following is an excerpt from a striking editorial in a recent issue of "The Producers' Review" (Toowoomba, Q.):—

With reluctance we have been forced to the conclusion that human nature readily finds a groove which shackles it to the ordinary every-day task of earning a living. The tragedy of many potentially able minds is that routine work and routine thinking become almost automatic, until the ability to think along original lines is destroyed, in the same way as a limb becomes atrophied if it is not in use. To-morrow will not bring anyone greater power and authority unless these are being stored to-day.

How can men acquire the ability and the habit to think freshly, critically, and dispassionately on problems which confront humanity? Perhaps the starting point is in a recognition that the ordinary daily task is but a repetition of habits and thought applied until it can be performed as easily as rolling off a log, and a realisation of that fact will show that in its doing there is no real advancement or development of faculties.

The next stage of effort is in the determination to do some concentrated thinking on problems other than the day's work. This can be done by applying the advice of a great thinker, who once said:—

"I believe in working on second wind. If a man is satisfied with just three meals a day and a roof over his head, perhaps he can manage to satisfy his wants by an ordinary day's work. But if he wants to store up reserve meals and shelter against the coming years, or build something worth while, he will have to learn to use his second wind. At the end of an ordinary day's work you feel fatigued. Pressing on further may seem difficult, even impossible. But if you will make this second start—draw on your second wind—you will soon uncover new layers of energy. Fresh supplies of working force come to your aid. Moreover, after a time, you can accommodate yourself to that additional effort, and not mind it. When this second supply is exhausted, you can uncover still another layer of energy."

All of us are potentially amenable to development. The men who achieve important positions in life depend less on their natural aptitudes or inherited gifts than on the acquired ability to fix attention upon a specific problem and to hold the mind to that problem until they have seen it through. The man who gets somewhere has to learn to make his mind behave in the direction which it ought to take in order that he can persist in affairs that are vital to him and to others, no matter what drudgery is involved. The starting point in thinking deeply on matters away from the obvious is in deciding to give, at regular intervals, a few hours' concentrated attention on some special subject. The focusing of our minds intently on some predetermined goal or problem is a knack that can be acquired once a person has got hold of the idea. Carlyle said that "the weakest living creature, by concentrating his powers on a single objective, can accomplish something; whereas the strongest may fail to accomplish anything."

There is no recipe for thinking, no mental tabloids producing thought as opium produces visions. But there is a hygiene of the mind resulting in thought as inevitably as bodily hygiene results in health. At all times in the past thinking has been helped by a disgust for the trivial, a retirement from nonsense, and by commerce with superior intellects. At no period in the future will it be helped by different methods. A long process? No, the least investment is productive at once. An exacting one? No, distinction is far more enjoyable than commonness. Only try.

Is the effort worth while of doing some thinking away from the commonplace? People know that they ought to do a great deal better than they pretend to do. Granted a sound body, with normal sense organs, men can and should develop in accordance with their general intelligence, and this can be done through long practice in doggedly doing, along with that which is agreeable, a lot of things that are tiresome and monotonous, going out of our way, if necessary, to find them.

It is the moments when one gives up and goes down on the job that make the difference. Without doubt there is a great deal of habit in what we do—the habit of floating along or the habit of resisting. No one can live out a normal life without coming to moments that are very important, moments when it is going to make a lot of difference whether one hits with all he has or lets it slide. In a critical moment we have to decide whether to get drunk, whether to push for a better job, whether to tell a hard truth or an easy lie, whether to do something requiring great effort. The details may vary endlessly; but it is the same punch that takes us through. Having the habit of it will make it come easier. Most people become so much creatures of their habits that they are afraid to stir beyond them.

Farm Blacksmithing.

In setting up a blacksmith's shop on the farm an endeavour should be made to secure the best and most convenient position away from other outbuildings. Old iron and timber can be used for the walls, but a good roof should be erected, because tools which will be of great value will be kept in the shop.

In fitting out the shop there are some tools absolutely necessary, and continually being used, whereas others are called on only occasionally. The anvil and blower, vice, drilling machine, stocks and dies, hacksaws and punches are of great assistance in repairing the various machines and implements.

Most of these are frequently offered at sales, and usually can be purchased at a reasonable figure. To be fully equipped as a repair shop, the bush carpenter's shop should be amalgamated with that of the blacksmith. The majority of machines contain a proportion of woodwork, and it is useless to commence to overhaul without having a few of the most commonly used carpenter's tools close at hand.

An assortment of nuts, bolts, washers, &c., within reach, is also of great benefit. One should not attempt to repair a machine, knowing that the necessary bolts or the equivalent in the making are not on the spot.

Although only a few in number, one is amply repaid by having them handy and labour saved will more than account for the interest.

Unless the farmer has had a good deal of experience, no attempt should be made to do large and heavy jobs, or work that requires accurate setting. In the latter case the job might appear quite all right, but when set in position it will be found to have a decided wobble, consequently worn bearings will follow. Repairs such as those just outlined should go to the tradesman.

Apart from machinery and implements to be repaired, there are numerous other things that come quite within the province of the amateur. Of these, plough chains, if used, are one of the most important items to be kept in good order. Not only is it much better to have them minus so much wire, but by keeping them evenly repaired much will be done to minimise the risk of sore shoulders.—"The New Zealand Farmer."

Bureaucracy.

Mr. J. Pearce Luke, President of the Wellington (N.Z.) Chamber of Commerce, in his address at its annual meeting, surveyed the world position, and pointed out that the records of history show that in a general upward movement there have been periods of retrogression. Invariably these periods have developed nobler traits by reason of the discipline inseparable from the experiences of "hard times." . . . A war embittering the contending nations; a peace pact imposing such conditions that the principal contestants have been in economic thrall ever since, and over and above it all the merciless threat of bureaucracy. Bureaucracy has determined the bounds of national development, and unless and until it is swept away there cannot be real national or international progress."

Tomatoes—Picking and Packing Points.

Care should be taken when gathering tomatoes that they are not bruised, or they will decay rapidly. Tomatoes that are to travel long distances, or occupy days in transit, should be picked when they begin to colour at the blossom end, or even when they take on a light green colour.

When packing, the fruit should be graded according to size and ripeness, all in each package being as nearly alike as possible; the grading regulations in force provide for a variation of not more than 1 inch in the diameter of the fruits in any case.

The fruit will thus look better, sell better, keep better, and pack or travel better; the arrangement will be found advantageous to the buyer and more profitable to the seller, besides establishing a reputation for the brand amongst buyers. Each package must have the contents and quality faithfully marked on the outside, so that buyers may learn to rely on the brands without wanting to overhaul the fruit.

Culls should not be marketed, but fed to pigs or destroyed, as is done with other refuse fruit.

Seasonal Points in Poultry Management.

During the summer there are many factors which tend to make a difference in the returns from a poultry farm, and a great deal depends upon the efficiency of management as to whether egg production is satisfactory or not.

As far as the layers are concerned, close attention to feeding is necessary to ensure a seasonable continuity of production; faulty feeding methods are the reason why many poultry-farmers fail to secure the egg production they should during the summer and autumn. It will be found that during a hot spell the birds do not require as much food as usual, and unless judgment is exercised in feeding there is likely to be a sharp decline in the egg yield, due to the hens becoming surfeited with food, resulting in digestive derangement.

The wisest course to follow when a heat wave is expected is to reduce the usual quantity of food in accordance with the appetites of the birds, so that no food is allowed to lie around throughout the day. In fact, it is preferable to keep the birds rather keen for their meals, and when a cool change comes, gradually to increase to the normal quantity.

Strict attention should be paid to the watering arrangements to ensure that fresh water is provided and kept as cool as possible. Also that the water vessels are placed in close proximity to the houses; the birds should not have to traverse long distances during the heat of the day to obtain water, as this often leads to high mortality. Where automatic watering systems are fitted, care should be exercised to see that the vessels are kept clean and free from contamination by mash or other organic matter which may cause fermentation; this applies particularly where dry mash is fed.

On many poultry farms insufficient ventilation is provided during the summer time. It is quite common to see houses for both young stock and adult birds without an aperture along the top of the back wall under the roof to provide ventilation. This is due to the erroneous idea that an open-fronted house is sufficiently ventilated, but it should be understood that unless a current of air can pass through a house there will not be free circulation of the air. Moreover, by having a fair-sized aperture under the roof much of the heat reflected by the roof is carried off. The deeper the house, the larger the aperture required; it is a wise plan to have an adjustable shutter to open in the summer time and close in the winter.

Lack of ventilation is one of the causes contributing to an outbreak of catarrh (or "roup") among young stock, particularly towards the end of the summer when the humidity is high.—A. and P. Notes, N.S.W. Dept. Agric.

Grazing Lucerne.

Grazing lucerne with the dairy herd has one advantage and two drawbacks, when compared with the plan of cutting the crop and carting it to the cow pastures. The advantage lies in the saving of labour, and, when a considerable area has to be handled, this is an item of considerable importance. On comparatively small farms, where the owner and his family do most of the work, cutting and carting the lucerne is undoubtedly the most economical plan.

The drawbacks to grazing are the shortening of the life of the stand and the necessity of more cultivation with the object of keeping down weeds, which take possession more quickly when the lucerne is grazed than when it is constantly cut, and there is the risk of loss from bloating. When the lucerne is cut there is no waste of material, but when grazed there is considerable waste through the trampling of the cows.

Whether the lucerne is grazed or cut, the land must be thoroughly cultivated at least once each season, in order to keep down weeds and stimulate the growth of the lucerne plants; but, as previously stated, more cultivation is required when the crop is grazed than when it is cut, for the reason that, in the former case, the weeds are rejected by the cows, and have an opportunity of spreading; while, in the latter case, lucerne and weeds are both cut down regularly and removed to the pasture before they have time to ripen their seeds.

It is considered a mistake to graze the first growth of the young lucerne, but I see no reason why the cows should not be turned in to pick up the cut material, provided they are not allowed to stay too long and injure the young shoots of the second growth. When lucerne is cut and carted to the pastures, it should be cut to-day and carted to-morrow.—Primrose McConnell in "The New Zealand Farmer."

Pasture Improvement Increases Production.

If any further evidence were required of the value of pasture improvement on coastal dairy farms it was provided by the past season's production figures at Berry Experiment Farm (N.S.W.). The total production was 8,910 lb. milk testing 4.22 per cent., averaging 376 lb. butter-fat per cow for the year ended 30th June last. Compare these figures with those for the year ended 30th June, 1927, before pasture improvement work was undertaken seriously. In that year total production was 7,562 lb. milk of 3.6 per cent. test, average 272 lb. butter-fat per cow.

It is of more than passing interest to know that last year's production figures include those of many heifers which are the progeny of the first animals reared on the treated pastures at Berry Farm, and which show a notable improvement in both appearance and production.

The Holstein as a Milk Producer.

Weight in Holstein dairy cows should not be mistaken for beef type, writes Dr. H. Epstein, D.Agr., a South African authority. No Holstein breeder wants beef, but he wants heavy, large-framed animals. He wants these, not because they carry large quantities of flesh, but because they are the biggest and most economical milk producers.

One of the world's biggest Holstein cattle breeders' associations has compared the records of a large number of its highest producers to their body weights with the following result:—

Average Live Weight Per Cow.	Average Milk Production.
Over 1,540 lb.	20,880 lb.
1,430-1,540 lb.	19,745 lb.
1,320-1,430 lb.	20,024 lb.
Under 1,320 lb.	17,668 lb.

The heavier cows have proved superior to the lighter ones as far as milk production is concerned, a fact which has been experienced in the United States as well.

But the heavier cow also needs less feeding for a certain amount of milk, a point which should be of the greatest interest to dairymen. One hundred pounds weight of starch equivalent enabled cows of—

Over 1,540 lb. to produce 202.4 lb. milk.
1,430-1,540 lb. to produce 204.3 lb. milk.
1,320-1,430 lb. to produce 200.9 lb. milk.
Under 1,320 lb. to produce 177.6 lb. milk.

Holsteins of the heavy type are, according to these extensive tests, not only the biggest, but also the most economical producers. In other words, the light, fine, old-fashioned dairy type in Holsteins is uneconomical in comparison with the heavy, strong, broad and deep-set modern dairy type.

To Protect Haystacks against Mice.

Many devices have come under notice from time to cope with the mice pest in relation to haystacks, observes a departmental publication. Building the stack upon a raised platform answers the purpose, if the blocks upon which the platform is built are capped with galvanised-iron guards or inverted petrol tins so as to prevent the mice reaching the platform boards. Another successful method of keeping them out is to enclose the stack with a fence of galvanised iron, either plain or corrugated, about 2 feet high. Let the iron into the ground to a depth of 4 inches, and place it in a slanting position, leaning outwards, all round the stack; take care to leave no open space at the corners. To ensure that mice do not enter a stack thus protected, care should be taken that straws, bags, or other articles are not allowed to hang from the iron fence or from the raised platform.

If it should be found that mice are troublesome in the stack, poison with arsenic dissolved in water. Place dishes of the solution all round the stack; if it will not entirely eradicate the pest, this method will help to keep it in check.

Proper precautions should, of course, be taken in using the above, as in the case of any other poison.—Ag. and P. Notes, N.S.W. Dept. Agric.

How long to Milk a Cow.

The number of cows which can be milked in an hour is a problem which appears to have puzzled people of all classes except those who have actually milked cows, to whom the matter is so simple.

The factors which control the number of cows which can be milked per hour are many and varied. The time of the year, the amount of milk produced, the ease or otherwise with which the milk can be drawn, and, of course, the skill of the milker vitally affect the situation. In the month of May, when in Cheshire and Shropshire the cows go out to grass, with probably a percentage of first-calf heifers with short teats among them, a very general number of cows for each milker is eight.

With average cows you have to slip along to get these milked and dripped within the hour, but it can generally be done when there is a fête or some other attraction ahead. Exceptionally good milkers could possibly milk twelve such cows in the hour, but it would hardly be a matter of ease.

There are short-teated heifers sometimes which would take up to fifteen minutes for the best of milkers to milk out clean, and there are nice easy cows from which a bucketful can be extracted in four or five minutes.

As the year advances and the cows drop off their milk, the number which can be milked in the hour naturally increases, and later on it would be no hardship or difficulty to milk fourteen in the hour.

With regard to the question, Is quick milking always thorough milking? Unfortunately, it is not. When it is thorough and clean, quick milking undoubtedly obtains the best results.—A. J. Lee in the "Livestock Journal" (England).

Pigs and Pork—What the Market Demands.

Mr. Charles Binnie, president of the Stockowners' Association of New South Wales, during his recent visit to England, made close inquiry into the pork and bacon trade of the United Kingdom, and has supplied us with some particulars which again confirm the conflicting requirements of the local and English markets as regards bacon. Mr. Binnie noticed in the retail shops that the "streaky" bacon that is generally fancied in Australia was the cheapest, being priced at about 9d. per lb., whereas the heavily-fatted cuts from the gammon and back were most in demand, and ranged in price up to 14d. per lb. Bacon or pork from Tamworth pigs was not favoured, that from the Large White being most sought after by the trade.

The differing tastes of the two countries is accountable for to a great degree by their dissimilar climatic conditions, the colder English climate favouring the consumption of comparatively fat bacon. Under the circumstances, it would appear that to meet the demands of both the overseas and local markets the pig-breeder in this country would have to raise two distinct types of baconers. At any rate, the Australian trade is at present well served by the Tamworth-Berkshire cross, bred back to the Berkshire or Tamworth.

The issues in connection with the pork export trade are not so confusing, although, as Mr. Binnie points out, the carcass most favoured is one between 70 and 80 lb. Maize-fed pork is not favoured in England, the fat being considered "tallowy." Pork from pigs fed on peas, beans, barley, or wheat, however, is quite acceptable to the trade. Mr. Binnie draws particular attention to the potentialities of wheat feeding for pork production, and suggests that pig breeding and fattening might, with profit, develop into more than a sideline with wheatgrowers, who, he claims, could get a return of 5s. a bushel for their wheat by marketing it "through" the pig.—"Agricultural Gazette" of New South Wales.

Maize Cultivation.

Harrowing the young maize crop is a very efficient means of killing young weeds, conserving moisture, and aerating and warming the soil to give the young plants a quick start. Deep cultivation may be practised in the early stages of growth, but as the roots spread shallow cultivation should be practised.

Where weeds cannot be controlled by other cultural operations, hilling may be necessary to check and smother weed growth. Hilling as a practice in cultivation cannot be recommended. Hilling with the plough is not generally advisable owing to the unavoidable destruction of roots, which gives the crop a setback.

The main object of all cultivation should be to keep down weeds.

White Hide—The Alum Tanning Process.

The following directions for the making of white hide are given by the lecturer in charge, Sydney Technical College Tanning School, in the "Agricultural Gazette" of New South Wales.

1. Soak the hide in clean water for four hours, then run off the dirty water and cover with clean water; leave for twenty-four hours. This should be sufficient for fresh or salted hides. Dry hides should be soaked for a further twenty-four hours, or until they are soft.

2. Remove the hair by soaking hides in milk of lime—30 lb. of lime per 100 gallons of water. Handle each day, and leave until the hair can be removed—about six to seven days in summer.

3. Remove all flesh and fat by scraping with a knife. Wash well with several lots of water during the twenty-four hours after removing the hair and pieces of flesh, fat, &c.

4. Tan in a solution of alum (5 lb.), salt (1½ lb.), Glauber salt (1½ lb.), and water (10 gallons). Use enough of the solution to cover the hides. Handle twice daily, and allow six days for tanning.

5. Drain well from the alum and salt solution, but do not wash; then cover both sides with fish oil or neatsfoot oil and hang up and allow to dry slowly. Tanners have a machine for forcing the oil fats, &c., into the hide.

6. When dry, stretch until soft. If dry skins are difficult to stretch, sprinkle with water and cover for two days; again stretch and dry.

Alum-tanned leather is sometimes covered with a paste instead of oil before drying. The paste is made up as follows:—

5 lb. flour,
2½ lb. alum,
1 lb. salt,
1 lb. neatsfoot oil,
1 to 1½ gallons water.

Mix the alum and salt with water and then the flour and oil in a separate basin. Add to the flour and oil sufficient of the alum and salt solution to make a paste. Put the hide and paste into a tub, and handle the hide vigorously so as to force the paste into the leather. Hang the leather up and allow it to dry slowly without removing the paste. If the leather is too firm, rub on more fat, such as soft dripping, &c. If possible, stretch the leather just before it is quite dry. After stretching, it can be nailed on a wall or similar surface.

Bees and Fruit—A Profitable Combination.

Heavy losses are sustained annually by fruit-growers as a result of their trees not bearing well, which in many cases is due to defective pollination of the flowers of the trees, runs an article in the "Agricultural Gazette" of New South Wales. Investigations have shown that insects play an important role in the pollination of flowers, and in this regard there is none more industrious than the honey bee. If it were possible for human hands to do what the bee does, it is safe to predict that the owner of those hands would commercialise his ability and command a substantial wage. That the bee does it for nothing and is therefore neglected only goes to prove the old saying that what you get for nothing is often valued at cost price.

Of all the insects that visit flowers the highest frequency belongs to bees, though there are other insects, such as the Syphrid flies, small beetles, &c., that assist in the transference of pollen from one flower to another. The bee is, however, the best equipped for this function. Inside the flower, nectar is secreted, and this attracts the insect, which, while crawling about within the flower in search of the nectar, accumulates pollen on its hairy body, and when it settles on another flower some of the pollen is bound to adhere to the sticky pistil of that flower. It has been shown that by placing a beehive in an orchard during the flowering season it is possible to enhance the fruit crop, even though the orchard may be in a fruit area famed for the production of good crops in normal seasons, and it has also been shown that the trees nearest to the hive bear the best crops.

The distance the pollen can be carried and the number of flights made by each bee will depend on weather conditions and the size of the swarm. On warm, sunny days the bees are more active than during cold or cloudy weather.

Experiments in other countries and experience in this country have shown that even with cold weather during the flowering season the trees nearest the hives bear better than those farther away. Thus, the greatest distance to which "suitable" pollen can be carried from its source to the trees to be fertilised is determined by the nature of the seasons. "Suitable" pollen is that which will produce good results after pollination. For example, the pollen of certain tree varieties will only be suitable for certain other varieties, e.g., certain apple varieties for other apples, as is also the case with pears, plums, strawberries, and almonds.

Discussing this subject, a South African authority recommends that bees be kept at the rate of one strong colony, or, where possible, two colonies to the morgen (about two-thirds of an acre). The hives should be moved about in the orchard during the flowering season, and removed thereafter.

QUEENSLAND RECORD IN BACON PIG SLAUGHTER.

To have slaughtered more than a million bacon pigs and to have supervised the slaughter of several millions more, is the record of Mr. Sam Mison, the veteran foreman of J. C. Hutton's bacon factory at Zillmere. It is certainly a Queensland record, and may be a world record.

Born in Gibralter in 1869, Mr. Mison landed in Queensland with his parents some six years later. His parents were among the first settlers at Lutwyche where, for many years, his father was engaged in brickmaking. Sam's first job was carting bricks to the Brisbane Grammar Schools and Boggo Road Gaol. Always interested in pigs, Sam's first outside experience in slaughtering was at the co-operative slaughter yards at the Grange, then known as Mooney's yards. While thus engaged, this energetic youth attracted the attention of J. C. Hutton's, who were then located in the Valley, and Sam's job was washing bacon and hams in the process of curing.

There were few pigs bred in Queensland for the bacon trade in those early days, most of the supply coming from Melbourne and New Zealand. The late Mr. John Reid, for half a century prominent in the Queensland bacon trade, just about that time located the site at Zillmere where the factory still stands and purchased the property from Mr. John Lees. This was about 1889, and shortly afterwards Sam was engaged as slaughterman, and carried on this work for two years or more. He felt he would like to see more of the world, so resigned and moved north as far as Burketown, where as a brickmaker he prepared bricks for a large boiling-down works at that centre. Thence he returned to Brisbane and was engaged by the Hollandier Meat Company, owned by Mr. William Dobbyn.

A breakdown in the machinery threw Sam on the labour market until the keen-eyed John Reid again secured his services in March, 1894, and from that day to this Sam has been in the employ of the old firm.

In those days, of course, the method of treating pigs was different to the modern method now in use, and a man would kill a number of pigs, pass them on to the scalding tank, and help with the cleaning and dressing, which was all done by hand, and would take a full day to get through the number the dehairing machine now does in an hour.

It was while thus engaged in later years with the machines that Mr. Reid remarked to Mison that he thought he should be ashamed to look a pig in the face, seeing that on that day he had slaughtered his millionth pig.

For over twenty-five years Sam slaughtered between 60,000 and 70,000 pigs per annum. After the death of Mr. Frank Weston in 1915, who was then foreman of the works, he was appointed to that position and has held the important post until now. Sam well remembers the days when the farmers from the Dayboro and surrounding district would leave home the night before pig slaughter day with their German wagons to cart their pigs to Zillmere. They are now delivered by train and motor lorry.

Sam still carries on the good work and has a wide circle of friends in the business and social world of the district in which he resides, and is ever willing to lend a helping hand in any movement aiming at progress and improvement of the conditions of the man on the land.

—E. J. SHELTON, Senior Instructor in Pig Raising.

PLATE 23.
Entrance to Gorge, Carnarvon Range, Queensland. Note the peculiar rock formation on the right suggestive of a rugged human face.

PLATE 24.
Looking up Mooleyamba Creek from the first crossing, Carnarvon Range, Queensland.
[*Photos.: J. L. Bowman, Dept. Agriculture and Stock, Brisbane.*

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staffs of the Queensland Baby Clinics, dealing with the care and general welfare of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable cases of infant mortality.

HOLIDAY TRAVELLING.

TRAVELLING with a baby and several small children is no holiday for their mother. Unless she plans everything carefully beforehand a long train journey may end with an exhausted mother and a handful of cross, tired, over-fed children, who will be sick for the next few days. Perhaps a little advice at this season of the year may be helpful.

Food.

It is most important that this should be carefully considered beforehand. The breast-fed baby, who has been properly managed should give no trouble at all. But it is not so with the bottle-fed infant. We have seen many who have been seriously upset by milk which has gone bad in the train, especially in hot weather. It is true that there are ways of carrying the baby's milk safely. But these require so much care and understanding, and the consequences of any mistake may be so serious, that we cannot advise them. Nor can we advise the mother on a journey to buy milk at the railway stations. Much the safest plan is to carry a supply of good dried milk (Glaxo or Lactogen) not, of course, dried skimmed milk. Boiling water is always procurable, and it may also be carried in vacuum flasks, so that it is always possible to scald the bottles and teats, and to make up the feeds for each meal. Any milk left after a feed should be thrown out at once, never left in the bottle. It is well to carry more than one bottle and teat. These should be wrapped in clean boiled butter muslin and carefully packed in a tin. Though the baby may not be used to dried milk, it will do him no harm, provided it is not made too strong. It will be wise to make it up rather weaker than advised on the tin. At the end of the journey, when good fresh milk is procurable, he will soon make up for having been on a rather weak mixture for one or two days.

For the toddlers avoid bought foods, cakes, and sweets, which may do him much harm, especially as the novelty and excitement will very probably have weakened his digestion. Remember that a day of rather short rations will do him no harm, but a day of over-feeding may go a long way to spoil his holiday and your own too. Carry your own provisions. Pack a tin with some slices of baked bread and oatcake, which may be ready buttered, and some sandwiches, preferably of brown bread. These may contain lettuce, sliced tomatoes, egg, either sliced or scrambled, or soft cheese spread on butter, or marmite. Add a few dates and raisins, apples, and oranges, and you have all the solid food necessary. He may drink dried milk dissolved in hot water, like his baby brother, or you may carry one or two lemons with a small packet of sugar, which will make a drink he will surely relish. Let him have his little picnics at the right times, but don't try to keep him quiet by feeding him all the time. You won't succeed, it will only make him cross and irritable, miserable himself, and a torment to others. But let him have a drink of water when he wants it.

Amusement.

Most children will be interested in looking out of the window until they are tired, but don't let them tumble out. It may be well to carry a few simple toys and picture books and writing pad and a pencil.

Clothing.

You won't need to carry much wraps in the summer, but a light rug and cushion will be useful. For the baby have a plentiful supply of napkins, and some old newspapers or a mackintosh bag for the wet napkins.

Rest and Sleep.

These are important if over-fatigue and fretfulness are to be avoided. A dress-basket is most useful for a young baby. Properly managed he will sleep or lie awake in this quite contented, and much happier than if constantly nursed in the arms of an over-heated and exhausted mother.

If you have trained your children well you will reap your reward when travelling. How sad it is to see children in the train scrambling over everything, eating an endless supply of cakes and sweets, grubby and tired, ignoring their mother's efforts at control, and finally fretful and crying from sheer exhaustion and discomfort.

COUNTRY WOMEN'S CLUB WORK.

Writing in the Agricultural Bureau Record (New South Wales), Miss Lorna Byrne, B.Sc.Agr., Assistant Organiser of Women's Branches of the Bureau, makes the following useful suggestions for country women's organisations:—

DURING the past year a considerable number of branches have formed special women's committees, which are apparently functioning with much success. Other branches are considering this activity, but some of them still seem to be somewhat in doubt as to how the work of the women in this direction might be carried out.

There are already several women's clubs and they are doing excellent work, but there is sometimes a tendency, when a club is formed, for it to become almost a separate women's organisation. Should this occur it would be very undesirable, as there is already one important women's organisation—the Country Women's Association—which is doing wonderful work amongst the women of the State, and it would be regrettable if we created any overlapping.

The ideal branch is the one which arranges that the men and women shall meet together on the majority of occasions for talks, demonstrations, debates, and social activities which are of common interest, but there are obviously occasions on which the subjects of most interest to the men would be of little concern to the majority of the women in the branch. It is then desirable that the women's committee should take charge of the women present at that particular meeting.

I have often been asked, "What can we do at such a women's meeting?" I would like to suggest that the knowledge of the women in the district should be organised through this committee and made available to other women members. It is a very good plan to make a list of the women members and then to ask the question, "Who does what well?" It is quite easy then to find the women who are most qualified to deal with certain topics of interest. For instance, one woman is probably more expert than some of the others in the art of flower gardening. It would be very useful then, if on one occasion, she would take the women members through her garden and discuss with them the methods of preparation of the beds, the propagation of plants and the conservation of moisture in the soil. Another woman probably has had experience in dressmaking and millinery and a "renovation afternoon" might well be recommended under her guidance. Sometimes again, a demonstration in the kitchen by a member on preserving of fruits, making of pulp, uses of dried fruits, sweet-making, cake decorating, and allied subjects would be found very helpful to a number of the members. So one could go on enumerating the very many topics of direct concern to the majority of the members of women's sections, which could effectively be discussed, by individuals who have either, through longer experience, or more expert training, gained more information on certain subjects than other women have been able to do.

Apart from household matters, one might suggest that doctors, dentists, nurses, and officials of the Railway and Health Departments, as well as ambulance officers might well be invited to visit the branches and discuss such matters as health, home-nursing, care and development of the teeth and first aid. Already numbers

of addresses and demonstrations have been given by the courtesy of these professional people, and they have proved invaluable in spreading the propaganda of good health among many of our members.

In regard to first aid, some of the branches have been a little inclined to shun such a topic, thinking that it would be necessary for members to carry out a full course, and this, I consider, would be rather difficult for the majority of our Bureau branches. At the same time a knowledge of what to do in case of accident—for example, a knowledge of the arresting of bleeding, the making of an improvised stretcher, the temporary setting of a broken bone, the treatment of snake-bite and antidotes for poisons—is absolutely necessary for the majority of people who live in the country, so that talks and demonstrations on these matters can well be recommended, even though a full course with the necessary examination for a first aid certificate may not be practicable. I would like to suggest also that every branch should endeavour to include in its library a first-aid handbook.

CITRUS FRUITS IN THE KITCHEN.

Orange Delight.—Peel and remove the pith of six oranges. Slice thinly in rings, removing the seeds. Arrange in a glass dish or a pyrex, and sprinkle with sugar. Pour a rich boiled custard over the top. Make a meringue with the whites of eggs and head it on top of custard, then garnish with grated orange peel. Set meringue in oven; stand the glass in pan of water while in the oven.

Orange Quarters.—Take three oranges, ½ teaspoon citric acid or juice of two lemons, 2 cups hot water, 1 tablespoon brandy or sherry, little cochineal, and 3 dessertspoons gelatine. Cut oranges in halves, scoop out centre, leaving only the skins; do not break them. Dissolve gelatine, sugar in hot water, add acid or lemon juice, sherry or brandy, and colour half the mixture with a few drops of cochineal. When cool pour mixture into shells or skins, and allow to set. Serve on a bed of green leaves.

Orange Compote.—Take ⅓ pint of water, ¼ lb. sugar, and six oranges. Peel oranges, divide into sections, boil sugar and water with shreads of orange peel. Take out the peel and put the orange sections in the syrup and simmer gently ten minutes. Take out and arrange in a glass dish. Add a couple of sheets of gelatine dissolved in water to the syrup and allow syrup to cool a little; then pour over the oranges.

Lemon Trifle.—Items required are 3 cups water, 1½ cups sugar, juice and rind of two lemons, 2 tablespoons arrowroot, and whites of two eggs. Boil the water, sugar, and lemon juice together, then add the blended arrowroot, and when cooked add the stiffly-beaten whites. Serve cold with custard made from yolks.

Orange or Lemon Shape.—Take 3 eggs, ½ oz. gelatine, 2 oz. sugar, cup of hot water, rind of a lemon grated, and juices 2 oranges or lemons. Soak gelatine in hot water, whip whites of eggs till stiff; gradually pour on gelatine and water, beating all the time, beat yolks and add sugar, beat all together. Pour into a wet mould till set.

TO SUBSCRIBERS—IMPORTANT.

Several subscriptions have been received recently under cover of unsigned letters. Obviously, in the circumstances, it is impossible to send the journal to the subscribers concerned.

It is most important that every subscriber's name and address should be written plainly, preferably in block letters, in order to avoid mistakes in addresses and delay in despatch.

Orchard Notes for February.

THE COASTAL DISTRICTS.

FEBRUARY in coastal Queensland is frequently a wet month, and, as the air is often heavy with moisture and very oppressive, plant growth of all kinds is rampant, and orchards and plantations are apt to get somewhat out of hand, as it is not always possible to keep weed growth in check by means of cultivation. At the same time, the excessive growth provides a large quantity of organic matter which, when it rots, tends to keep up the supply of humus in the soil, so that, although the property looks unkempt, the fruit-producing trees and plants are not suffering, and the land is eventually benefited. When the weed growth is excessive and there is a danger of the weeds seeding, it is a good plan to cut down the growth with a fern hook or brush scythe and allow it to remain on the ground and rot, as it will thereby prevent the soil from washing, and when the land is worked by horse power or chipped by hand it will be turned into the soil. This is about the most satisfatcory way of dealing with excessive weed growth, especially in banana plantations, many of which are worked entirely by hand.

The main crop of smooth-leaf pineapples will be ready for canning, and great care must be taken to see that the fruit is sent from the plantation to the cannery with the least possible delay and in the best possible condition. The only way in which the canners can build up a reputation for Queensland canned pineapples is for them to turn out nothing but a high-class article. To do this they must have good fruit, fresh, and in the best of condition.

The fruit should be about half-coloured, the flesh yellowish, not white, of good flavour, and the juice high in sugar content. Over-ripe fruit and under-ripe fruit are unfit for canning, as the former has lost its flavour and has become "winey," while the latter is deficient in colour, flavour, and sugar content.

For the 30 or 32 oz. can, fruit of not less than 5 in. in diameter is required, in order that the slices will fit the can; but smaller fruit, that must not be less than 4 in. or, better still, 4¼ in. in diameter, and cylindrical, not tapering, can be used for the 20-22 oz. can.

Bananas for shipment to the Southern States should on no account be allowed to become over-ripe before the bunches are cut; at the same time, the individual fruit should be well filled and not partly developed. If the fruit is over-ripe it will not not carry well, and is apt to reach its destination in an unsaleable condition.

Citrus orchards require careful attention, as there is frequently a heavy growth of water shoots, especially in trees that have recently been thinned out, and these must be removed. When there are facilities for cyaniding, this is a good time to carry out the work, as fruit treated now will keep clean and free from scales till it is ready for market. Citrus trees can be planted now where the land has been properly prepared, and it is also a good time to plant most kinds of tropical fruit trees, as they transplant well at this period of the year.

A few late grapes and mangoes will ripen during the month, and, in respect to the latter, it is very important to see that no fly-infested fruit is allowed to lie on the ground but that it is gathered regularly and destroyed. Unless his is done, there is every probability of the early citrus fruits being attacked by flies bred out from the infested mangoes.

Strawberries may be planted towards the end of the month, and, if early ripening fruit is desired, care must be taken to select the first runners from the parent plants, as these will fruit quicker than those formed later. The land for strawberries should be brought into a state of thorough tilth by being well and deeply worked. If available, a good dressing of well-rotted farmyard manure should be given, as well as a complete commercial fertilizer, as strawberries require plenty of food and pay well for extra care and attention.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELAND.

THE marketing of later varieties of peaches and plums and of mid-season varieties of apples and pears, as well as of table grapes, will fully occupy the attention of fruitgrowers in the Granite Belt, and the advice given in these notes for the two previous months with regard to handling, grading, packing, and marketing

is again emphasised, as it is very bad policy to go to all the trouble of growing fruit and then, when it is ready to market, not to put it up in a way that will attract buyers.

Extra trouble taken with fruit pays every time. Good fruit, evenly graded and honestly packed, will sell when ungraded, and badly packed fruit is a drug on the market. Expenses connected with the marketing of fruit are now so high, owing to the increased cost of cases, freight, and selling charges, that it is folly to attempt to market rubbish.

During the early part of the month it will be necessary to keep a careful watch on the crop of late apples in order to see that they ore not attacked by codlin moths. If there is the slightest indication of danger, a further spraying with arsenate of lead will be necessary, as the fruit that has previously escaped injury is usually that which suffers the most.

Fruit fly must also be systematically fought wherever and whenever found, and no infested fruit must be allowed to lie about on the ground.

Grapes will be ready for market, and in the case of this fruit the greatest care in handling and packing is necessary. The fruit should never be packed wet, and, if possible, it is an excellent plan to let the stems wilt for a day at least before packing. This tends to tighten the hold of the individual berries on the stem and thus prevent their falling off.

In the western districts winemaking will be in progress. Here again care is necessary, as the better the condition in which the fruit can be brought to the press the better the prospect of producing a high-class wine.

Where necessary and possible citrus trees should be given a good irrigation, as this will carry on the fruit till maturity, provided it is followed up by systematic cultivation so as to retain a sufficient supply of moisture in the soil.

Farm Notes for February.

REFERENCE was made in last month's Notes to the necessity for early preparation of the soil for winter cereals, and to the adoption of a system of thorough cultivation in order to retain moisture in the subsoil for the use of crops intended to be raised during the season. The importance of the subject, and its bearing in relation to prospective crop yields, is made the excuse for this reiteration.

Special attention should be given to increasing the area under lucerne (broadleaf Hunter River) wherever this valuable crop will grow. Its permanent nature warrants the preparation of a thorough tilth and seed bed, and the cleansing of the land, prior to sowing the seed, of all foreign growths likely to interfere with the establishment and progress of the crop. Late in March or early in April is a seasonable period to make the first sowing providing all things are favourable to a good germination of seed.

Dairymen would be well advised to practise the raising of a continuity of fodder crops to meet the natural periods of grass shortage, and to keep up supplies of succulent fodder to maintain their milch cows in a state of production.

Many summer and autumn growing crops can still be planted for fodder and ensilage purposes. February also marks an important period as far as winter fodder crops are concerned, as the first sowings of both skinless and cape barley may be made at the latter end of the month in cool districts. Quick-growing crops of the former description, suitable for coastal districts and localities where early frosts are not expected, are Soudon grass, Japanese and French millet, white panicum, liberty millet, and similar kinds belonging to the Setaria family. Catch crops of Japanese and liberty millet may also be sown early in the month in cooler parts of the State, but the risk of early frosts has to be taken.

Maize and sorghums can still be planted as fodder and ensilage crops in coastal districts. In both coastal and inland areas, where dependence is placed largely on a bulky crop for cutting and feeding to milch cows in May and June, attention should be given to Planters' Friend (so-called Imphee) and to Orange cane. These crops require well-worked and manured land; the practice of broadcasting seed for sowing at this particular season encourages not only a fine stalk but a density of growth which in itself is sufficient to counteract to some extent the effect of frost.

In most agricultural districts where two distinct planting seasons prevail, the present month is an excellent time for putting in potatoes. This crop responds to good treatment, and best results are obtainable on soils which have been previously well prepared. The selection of good "seed" and its treatment against the possible presence of spores of fungoid diseases is imperative. For this purpose a solution of 1 pint of formalin (40 per cent. strength) to 24 gallons of water should be made up, and the potatoes immersed for one hour immediately prior to planting the tubers. Bags and containers of all kinds should also be treated, as an additional precaution. "Irish Blight" has wrought havoc at times in some districts, and can only be checked by adopting preventive measures and spraying the crops soon after the plants appear above the ground. Full particulars on the preparation of suitable mixtures for this purpose are obtainable on application to the Department of Agriculture, Brisbane.

Weeds of all kinds, which started into life under the recent favourable growing conditions, should be kept in check amongst growing crops; otherwise yields are likely to be seriously discounted. The younger the weeds the easier they are to destroy. Maize and other "hoed" crops will benefit by systematic cultivation. Where they are advanced, and the root system well developed, the cultivation should be as shallow as possible consistent with the work of weed destruction.

First sowings may now be made of swede and other field turnips. Drilling is preferable to broadcasting, so as to admit of horse-hoe cultivation between the drills, and the thinning out of the plants to suitable distances to allow for unrestricted development. Turnips respond to the application of superphosphate; 2 cwt. per acre is a fair average quantity to use when applied direct to the drills.

Where pig-raising is practised, land should be well manured and put into good tilth in anticipation of sowing rape, swedes, mangels, field cabbage, and field peas during March, April, and May.

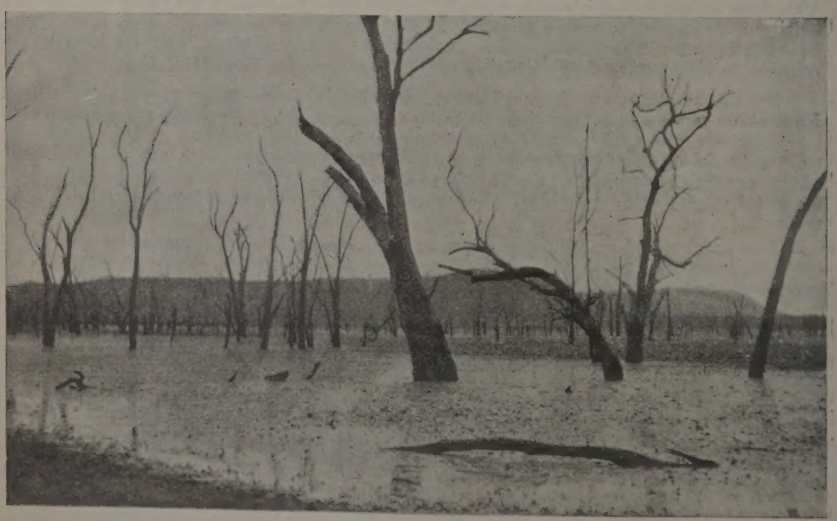

PLATE 25.

Lake Nuga-Nuga, covering a drowned forest resulting from the overflow of Mooleyamba Creek at Warranilla, below the head of the Browne River, a tributary of the Dawson.

[*Photo.: Mr. J. L. Bowman.*

CLIMATOLOGICAL TABLE—NOVEMBER, 1933.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.				Total.	Wet Days.
		Max.	Min.	Max.	Date.	Min.	Date.		
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·84	86	73	89	23	71	8, 9, 15, 17, 21, 24, 25, 29	245	8
Herberton	..	79	61	87	22	54	16	601	14
Rockhampton	29·95	82	67	91	23	61	13	514	12
Brisbane	30·03	77	63	84	26	58	3	841	19
Darling Downs.									
Dalby	29·99	79	60	87	3	50	2	716	15
Stanthorpe	..	72	53	80	2, 3	47	3	541	17
Toowoomba	..	73	57	85	3	51	3	845	21
Mid-interior.									
Georgetown	29·86	94	64	99	2	53	1	796	7
Longreach	29·88	90	66	99	25	60	12	624	12
Mitchell	29·94	80	62	92	3	49	10	793	14
Western.									
Burketown	29·84	93	74	100	22	67	13	46	1
Boulia	29·84	95	69	107	17	59	21	102	4
Thargomindah	29·89	87	67	105	1	56	10	216	6

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF NOVEMBER, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING NOVEMBER, 1933, AND 1932, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Nov.	No. of Years' Records.	Nov., 1933.	Nov., 1932.		Nov.	No. of Years' Records.	Nov., 1933.	Nov., 1932.
North Coast.	In.		In.	In.	*Central Highlands.*	In.		In.	In.
Atherton	2·19	32	5·14	0·27	Clermont	1·98	62	7·60	2·04
Cairns	3·75	51	14·04	1·68	Gindie	2·02	34	0	3·84
Cardwell	4·00	61	11·48	1·75	Springsure	2·10	64	6·72	2·61
Cooktown	2·56	57	2·45	0·93					
Herberton	2·49	47	6·01	0·07					
Ingham	3·65	41	13·81	5·16					
Innisfail	6·06	52	23·65	1·56					
Mossman Mill ..	4·06	20	9·50	1·73	*Darling Downs.*				
Townsville	1·82	62	5·86	1·98	Dalby	2·71	63	7·16	3·76
Central Coast.					Emu Vale	2·69	37	6·19	3·53
					Hermitage	2·65	27	0	4·39
Ayr	1·63	46	5·02	1·48	Jimbour	2·42	45	7·84	3·67
Bowen	1·25	62	3·57	0·13	Miles	2·49	48	9·05	3·21
Charters Towers ..	1·45	51	2·92	1·32	Stanthorpe	2·72	60	5·41	3·10
Mackay	2·99	62	13·65	1·39	Toowoomba ..	3·29	61	8·45	5·09
Proserpine	2·65	30	10·81	0·99	Warwick	2·63	68	5·45	5·82
St. Lawrence ..	2·27	62	7·89	0·85					
South Coast.									
					Maranoa.				
Biggenden	2·72	34	5·80	1·16					
Bundaberg	2·44	50	6·66	0·56	Roma	2·11	59	3·29	4·34
Brisbane	3·78	82	8·41	2·84					
Caboolture	3·39	46	8·30	2·44					
Childers	2·66	38	7·82	1·60					
Crohamhurst	4·34	40	11·89	4·64					
Esk	3·19	46	7·44	3·75					
Gayndah	2·90	62	6·38	5·31					
Gympie	3·13	63	9·77	1·74	*State Farms, &c.*				
Kilkivan	2·55	54	4·50	1·77					
Maryborough ..	3·11	61	8·84	1·86	Bungeworgorai ..	2·13	19	0	4·14
Nambour	3·76	37	14·87	2·67	Gatton College ..	2·80	34	11·15	4·81
Nanango	2·63	51	6·87	3·12	Kairi	2·16	19	4·88	0·06
Rockhampton ..	2·35	62	5·14	4·31	Mackay Sugar Experiment Station	2·64	36	11·82	2·02
Woodford	3·17	46	7·13	1·41					

GEORGE G. BOND, Divisional Meteorologist.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	January. 1934.		February. 1934.		Jan. 1934.	Feb. 1934.
	Rises.	Sets.	Rises.	Sets.	MOONRISE. Rises.	MOONRISE. Rises.
					p.m.	p.m.
1	5·0	6·50	5·24	6·46	7·17	7·40
2	5·1	6·50	5·25	6·45	8·0	8·10
2	5·2	6·50	5·26	6·44	8·27	8·38
4	5·2	6·50	5·27	6·44	9·8	9·9
5	5·3	6·50	5·28	6·43	9·37	9·41
6	5·3	6·50	5·29	6·43	10·6	10·15
7	5·4	6·51	5·30	6·42	10·35	10·57
8	5·5	6·51	5·30	6 42	11·7	11·47
9	5·6	6·51	5·31	6·41	11·38	..
					a.m.	a.m.
10	5·6	6·51	5·32	6·41	..	12·47
11	5·7	6·51	5·32	6·40	12·17	1·51
12	5·8	6·51	5·33	6·40	1·4	3·0
13	5·9	6·51	5·34	6·39	2·0	4·11
14	5·10	6·51	5·34	6·39	3·2	5·23
15	5·11	6·51	5·35	6·38	4·12	6·30
16	5·12	6·52	5·36	6·38	5·26	7·34
17	5·13	6·52	5·36	6·37	6·39	8·37
18	5·13	6·52	5·37	6·36	7·48	9·37
19	5·14	6·52	5·37	6·35	8·52	10·36
20	5·15	6·52	5·38	6·34	9·54	11·36
						p.m.
21	5·15	6·52	5·38	6·33	10·53	12·32
22	5·16	6·52	5·39	6·32	11·53	1·28
					p.m.	
23	5·16	6·52	5·39	6·31	12·41	2·22
24	5·17	6·51	5·40	6·30	1·47	3·11
25	5·18	6·51	5·41	6·29	2·42	3·35
26	5·19	6·50	5·43	6·27	3·36	4·36
27	5·20	6·50	5·44	6·26	4·27	5·9
28	5·20	6·49	5·45	6·25	5·15	5·42
29	5·21	6·49	..	..	5·59	..
30	5·22	6·48	..	..	6·37	..
31	5·23	6·47	..	..	7·10	..

Phases of the Moon, Occultations, &c.

1 Jan.	○ Full Moon	6	54 a.m.
9 „	☽ Last Quarter	7	36 a.m.
15 „	● New Moon	11	37 p.m.
22 „	☾ First Quarter	9	50 p.m.
31 „	○ Full Moon	2	31 a.m.

Perigee, 15th January, at 11.12 a.m.
Apogee, 28th January, at 5 a.m.

Jupiter rises at 2.1 a.m. on the 1st and at 1.13 a.m. on the 15th.

Saturn sets at 10.57 p.m. on the 1st and at 10.4 p.m. on the 15th.

At Brisbane—The Southern Cross does not come into view until about 11 p.m. on the 1st, low down in the S.S.E., head slanting downwards. Near the end of the month it may be seen in this position about 9 p.m. At Christmas time the Cross is noticeably absent during the evening hours.

Mercury will pass from Libra into Scorpio between the 1st and 15th; on the 14th it will be within half a degree of Beta Scorpii.

Venus will pass from Sagittarius into Capricornus by the 15th, and Mars will be apparently in Sagittarius during the month.

The Earth's nearest approach to the Sun will be on 2nd January, when fortunately 91,330,000 miles will separate them.

On the 6th, at 3 p.m., the Moon will be passing from west to east of Neptune, which will be 3 degrees north of it. Three days later the Moon will pass Jupiter at a distance of 6 degrees.

Venus, near the border of Aquarius, will become stationary on the 13th, then slowly retreat from Right Ascension 21.39 to 21 hours 16 minutes on the 31st.

Antares will be occulted by the Moon on the 12th when below the horizon in Queensland.

When the Sun sets on the 15th Mercury and the New Moon will be so close to it as to be entirely lost in the Sun's great light.

It will be interesting to notice that on the evening of the 15th Mars will set at 8.9 p.m., Saturn at 8.13, and Venus at 8.24, and that Mars and Saturn will draw nearer to one another till the 18th, after which they will be getting wider apart.

At 9 a.m. on the 17th Mercury will be in conjunction with the Moon when in the north-east by east. An hour later Saturn will be in conjunction with the Moon, also in broad daylight. Ten hours later, at 8 p.m., Venus too will be in conjunction with the Moon.

On the 20th Mercury will be on the farthest side of its orbit, almost in a line with the Sun, but a degree and a-half on the south side of it.

7 Feb.	☽ Last Quarter	7	22 p.m.
14 „	● New Moon	10	43 a.m.
21 „	☾ First Quarter	4	5 p.m.

Perigee, 12th February, at 9.18 p.m.
Apogee, 24th February, at 8.12 p.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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